DIESEL POWER

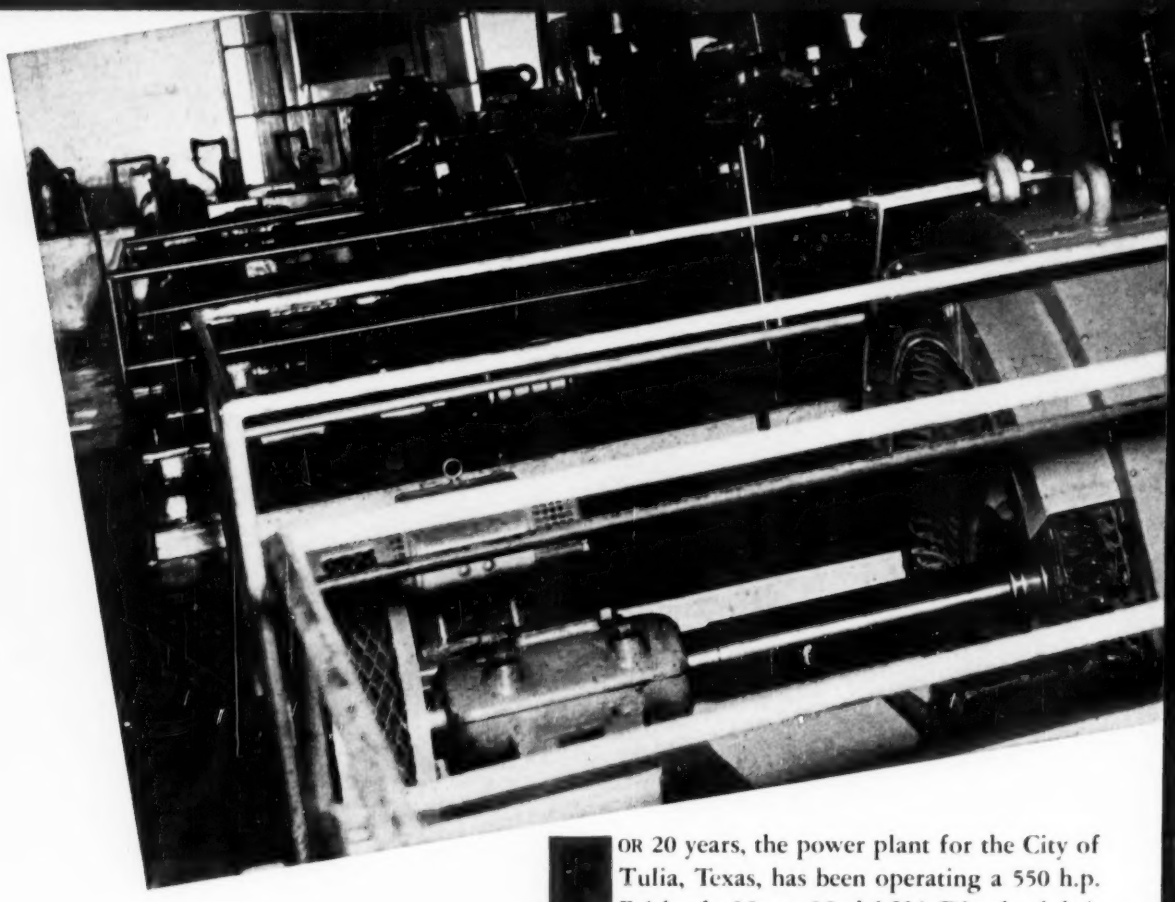
AND DIESEL TRANSPORTATION

January, 1953

- *Diesel Engine Prospects for 1953*
- *Waukesha Turbocharges*
- *Care and Selection of Antifreezes*

BUYERS' GUIDE

IN 20 YEARS — NO STUCK RINGS



FOR 20 years, the power plant for the City of Tulia, Texas, has been operating a 550 h.p. Fairbanks-Morse Model VA Diesel – lubricated exclusively with one of the famous *Texaco Ursa Oils*. Never once has there been a stuck ring. Regular inspections and major overhauls have invariably found the engine exceptionally clean. Wear has been slight, maintenance costs very low.

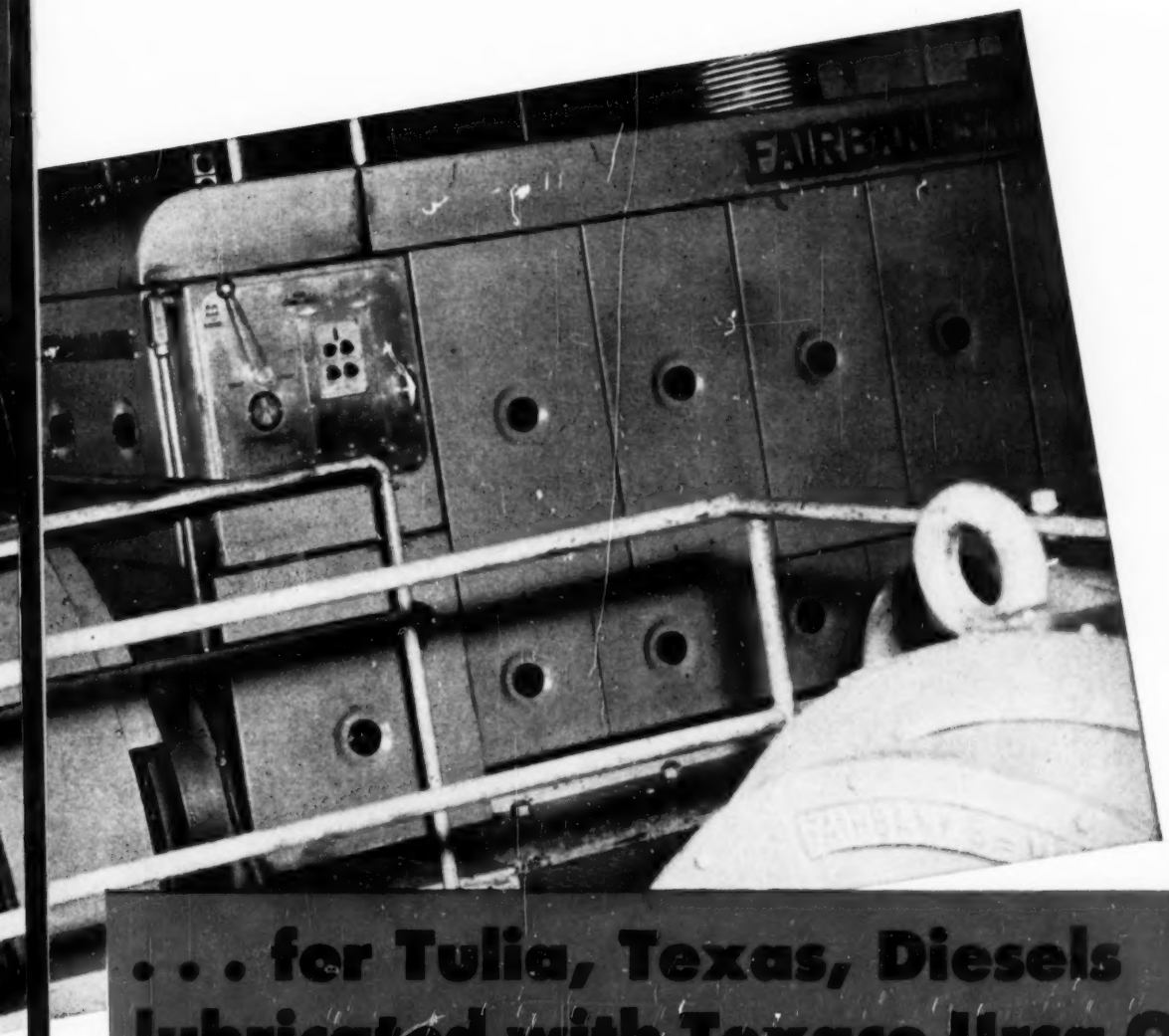
Thus, when the City of Tulia installed two new

TUNE IN . . . TEXACO STAR THEATER starring **MILTON BERLE**, on television **Tuesday nights.** **METROPOLITAN OPERA** radio broadcasts **Saturday afternoons.**

TEXACO

TEXACO

DIESEL POWER and DIESEL TRANSPORTATION for Jan. 1953, Vol. XXXI, No. 1. It is published monthly by Diesel Publications, Inc., Orange, Conn. Executive and Editorial offices at 192 Lexington Ave., New York 16, N. Y. Subscription rate: United States, $3.00 per year, single copies 35¢; Canada $4.00. Foreign $5.00 per year. Entered as second class matter April 29, 1949 at the Post Office, Orange, Connecticut under Act of March 3, 1879.



. . . for Tulia, Texas, Diesels lubricated with Texaco Ursa Oil

Model 31 Fairbanks-Morse Diesels in 1949, it was only natural that the lubricant chosen should be *Texaco Ursa Oil*. All three engines are running perfectly.

There is a complete line of *Texaco Ursa Oils*. Whether you're operating Diesel, gas or dual-fuel engines, you can get a *Texaco Ursa Oil* exactly right to give you top performance at lowest possible operating cost. That is one reason why –

For over 15 years, more stationary Diesel h.p. in the U. S. has been lubricated with Texaco than with any other brand.

Let a Texaco Lubrication Engineer help you get greater efficiency and worthwhile savings from *your* operation. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

For proven dependability...

AUTO-LITE

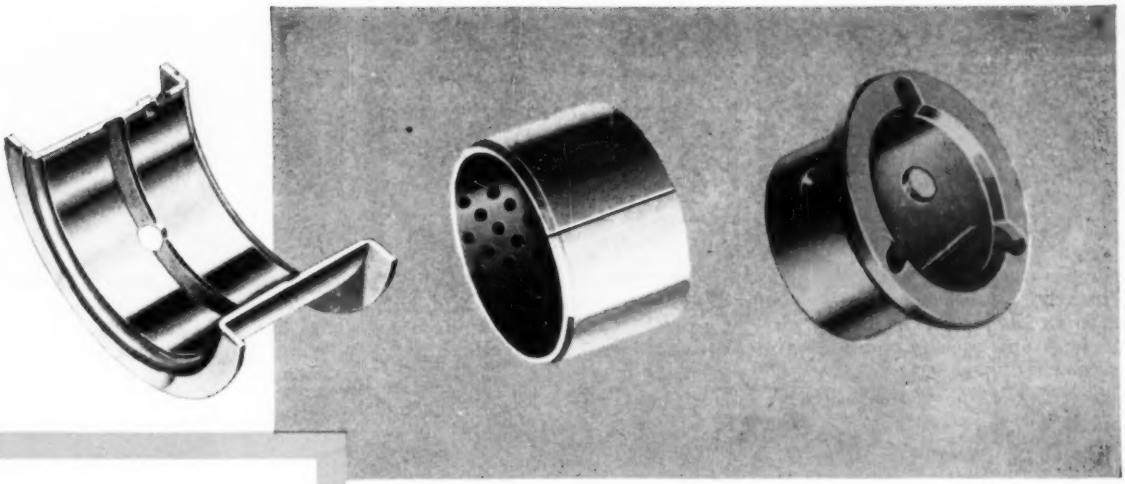
diesel equipment

For over 41 years Auto-Lite has been building complete electrical systems for the makers of many of America's finest cars, trucks and tractors. It is this experience that makes possible the outstanding dependability achieved in Auto-Lite Diesel Equipment—from generators to voltage controls—from batteries to starters. This unfailing reliability in service has helped to make Auto-Lite the world's largest independent manufacturer of automotive electrical equipment. If you have a particular diesel problem, Auto-Lite invites you to write to

THE ELECTRIC AUTO-LITE COMPANY
Toledo 1, Ohio — Sarnia, Ontario

STARTERS
BATTERIES
GENERATORS

Tune in "SUSPENSE!" . . .
CBS Radio Mondays . . . CBS Television Tuesdays



Products of our six plants include: Sleeve bearings in all designs and sizes; cast bronze bushings; rolled split-type bushings; bi-metallic rolled bushings; washers; spacer tubes; precision bronze parts and bronze bars.

FEDERAL Mogul

SINCE 1899

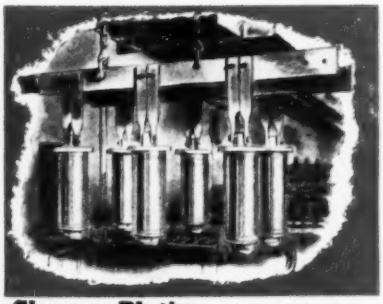
FEDERAL-MOGUL

FEDERAL-MOGUL CORPORATION

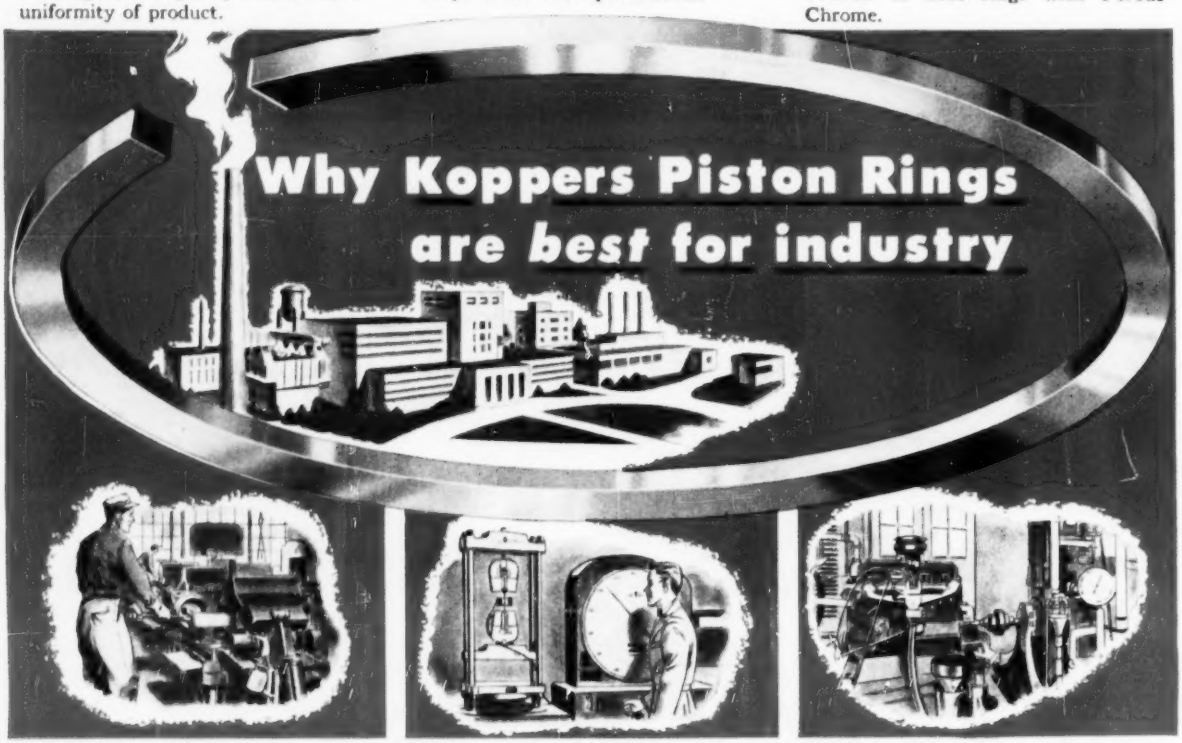
11041 SHOEMAKER, DETROIT 13, MICH.

Foundry . . . where top-quality raw materials first assume the shape of piston rings. Strict quality control assures uniformity of product.

Machine Shop . . . where every conceivable size and type of ring is precisely machined to specification.



Chrome Plating . . . where Koppers uses the famous Van der Horst Process to coat rings with Porous Chrome.



Centrifugal Casting . . . an exclusive Koppers process that increases the strength of rings up to 4 times that of ordinary rings.

Engineering & Research . . . where constant testing, checking and experimenting result in better and better piston rings.

Engine Testing . . . where Koppers Rings are tested under far more severe conditions than they will ever be subjected to in ordinary use.

KOPPERS manufactures piston rings in every size, of every type, for every conceivable purpose. Koppers has the solution to every ring problem, whether in gasoline or diesel engines, compressors, hydraulic presses, steam locomotives or any other industrial or aircraft applications.

Koppers engineering, research and manufacturing facilities are responsible for recent important piston ring developments, K-Iron® and Porous Chrome*. K-Iron is a high-grade, closely-controlled material that imparts superior wear properties to piston rings and is surface treated chemically as an anti-scuffing aid.

Koppers Porous Chrome Rings hold and distribute oil during the break-in, quickly wear to best possible seating, *cut cylinder wear up to 50%, last up to 4 times as long as ordinary rings!*

** Van der Horst Process*

Write, wire or phone us for experienced help with your problems. Koppers Company, Inc., Piston Ring Dept., 1541 Hamburg St., Baltimore 3, Md.

KOPPERS ®

Koppers American Hammered Industrial Piston Rings

Only **KOPPERS** *can furnish K-Spun® and Porous Chrome!*

WHO PIONEERED FULL-FLOW FILTRATION?

WINSLOW,
OF COURSE

WHO SAID IT WOULDN'T WORK?

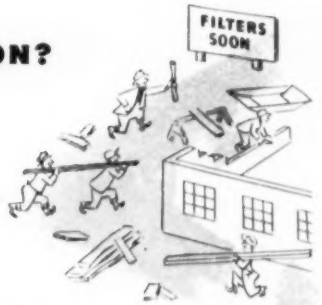
SEVERAL
COMPETITORS

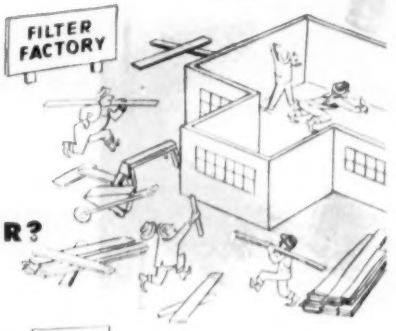
WHO IS NOW FALLING INTO LINE?

THOSE SAME
COMPETITORS

WHO IS STILL THE NATURAL LEADER?

WINSLOW, OF COURSE

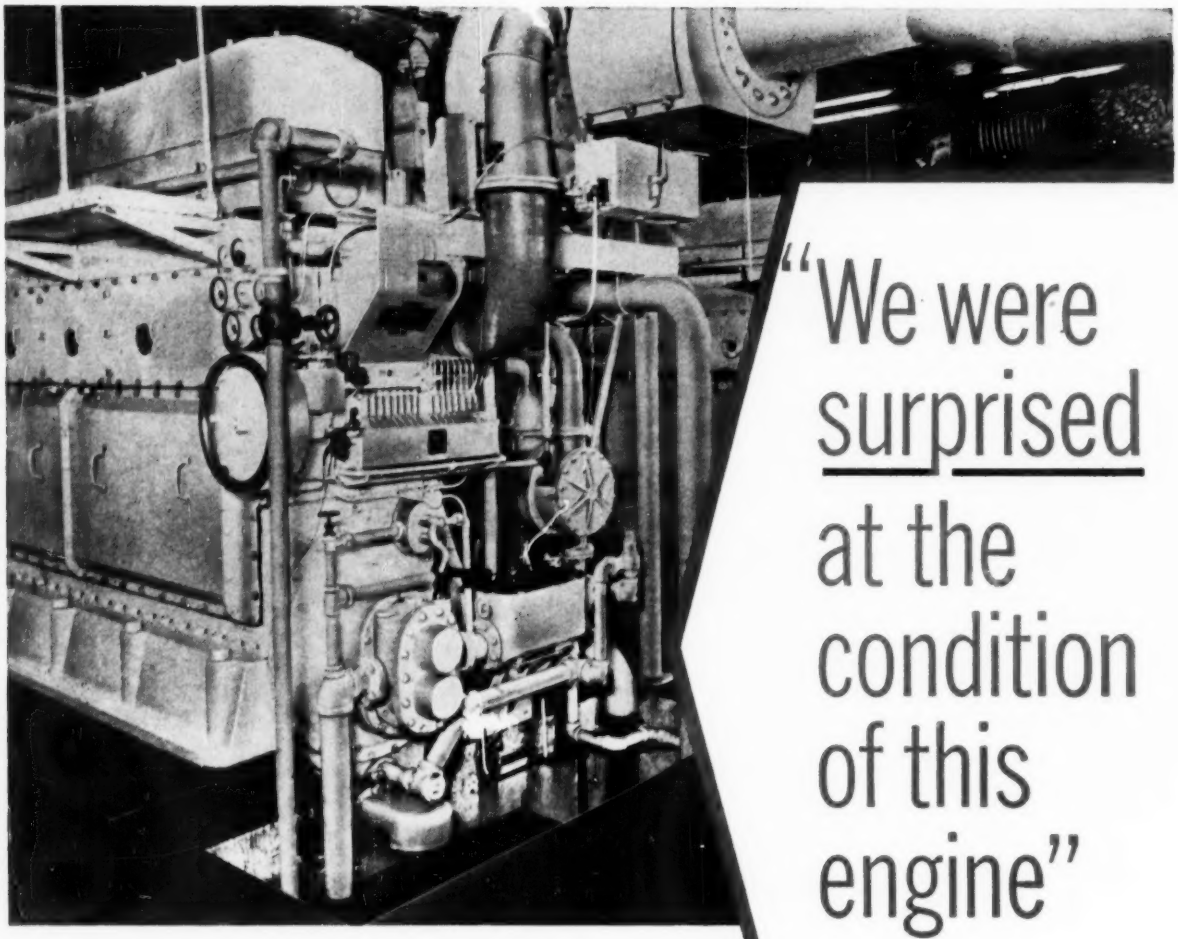




Write for our new **FREE BOOKLET**
containing full information.

WINSLOW FILTERS

Winslow Engineering Company · 4069 Hollis Street · Oakland 8, California



"We were surprised at the condition of this engine"

... says G. V. Yarger,
Supt. Municipal Utilities
Waverly, Iowa

"When we finally opened up our Worthington, it was in the *best* condition I've ever seen a diesel engine that had operated such long hours and under such heavy loads as this unit. It had a total of 48,926 hours on it – 8,987 hours of tough operation since the last overhaul.

Mr. Yarger continues, "We've been using Sinclair RUBILENE® Heavy in the crankcase and RUBILENE H.D. 30 in the cylinder lubricator. These RUBILENES have kept the crankcase and upper portions of the cylinders exceptionally clean and bright, with no sign of carbon or deposits."

That's a typical report on the exceptional qualities of the Sinclair RUBILENES . . . evidence that they could improve the efficiency of *your* diesels, too. Why not switch now? Contact your nearest Sinclair Representative or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

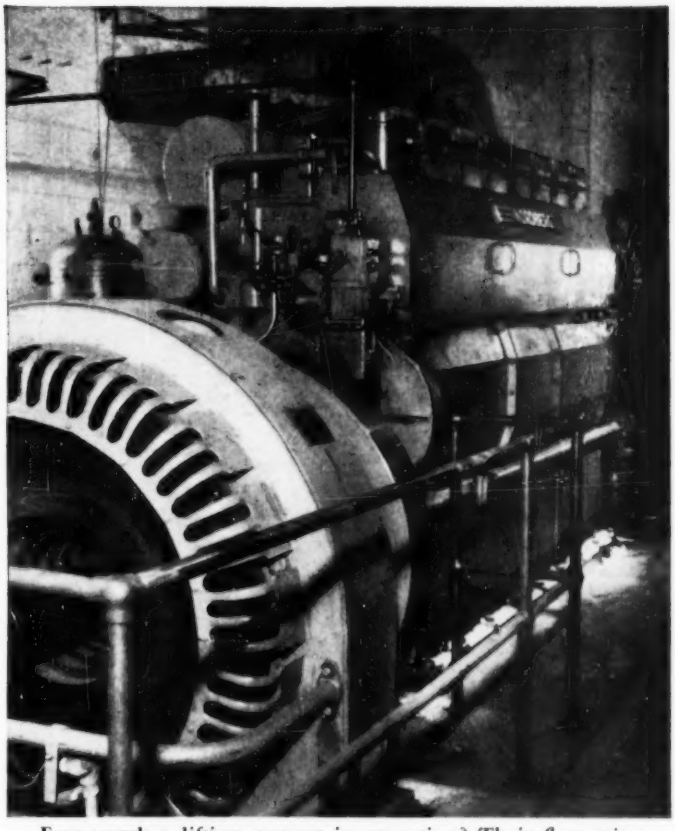
SINCLAIR DIESEL OILS

save wear and replacements

MORE POWER AT 50% LESS OPERATING COST

NORDBERG DUAFUEL® ENGINE increases capacity and stabilizes scrap yard operations

Your power problems may not involve electromagnets—but remember there are Nordberg Diesel, Duafuel® and Spark-Fired Gas engines built in sizes up to more than 10,000 hp—to meet practically every power requirement. Write for details, outlining your power needs.



Ever watch a lifting magnet in operation? Their fluctuating operation—from *no* load to *full* load in a matter of seconds, calls for a steady, reliable source of power—power that can stand the gaff of this kind of "up-and-down" service . . . *the kind of power you get with Nordberg Duafuel® engines.*

For proof, ask Consumers Steel & Supply Company, operators of one of the largest scrap yards in the Midwest. Here's what they did . . . to avoid expensive plant outages and provide more efficient, lower cost power generation, this progressive company installed a 530 hp Nordberg supercharged Duafuel Diesel engine driving a 320 kw generator. This single Nordberg engine took over the plant's power demand from three 66 kw high speed Diesel units. *The results:*

(1) Generating costs cut almost 50%; (2) Immediate response to changing load conditions; (3) Ability to operate balers, shears and cranes and magnets at full capacity—16 hours a day, 6 days a week; (4) Sufficient reserve for plant expansion.

Although of Duafuel design, the Nordberg engine is now operating on straight Diesel fuel. Further economies will be realized when gas availability will allow full Duafuel operation.

Nordberg Mfg. Co., Milwaukee, Wisconsin

NORDBERG

DIESEL • DUAFUEL® AND SPARK-FIRED GAS ENGINES

Builders of America's Largest Line of Heavy-Duty Diesels

P153

This aerial view of our plant will give you a good idea of our facilities for turning out crankshafts and forgings for diesels.

We have been at it since 1910, during which time we have been furnishing a constant and steady supply of crankshafts and forgings for use on diesel engines.

Manufacturers of diesels rely upon Ellwood City Forge for their most exacting requirements. We never disappoint them.

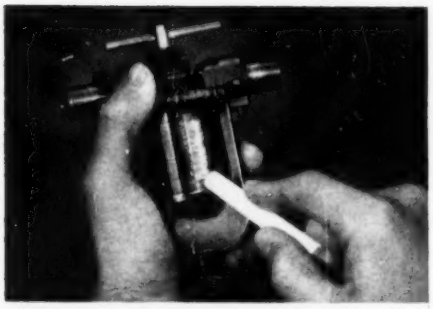
We suggest you write or look in on us for your crankshafts and forgings. We can take care of your needs in a thoroughly satisfactory manner.

Ellwood City Forge Company

ELLWOOD CITY PENNSYLVANIA

Here's how this strainer "combs" itself clean!

This simple chalk test shows how AUTO-KLEAN's unique built-in comb construction cleans the strainer without costly interruption of flow



ORDINARY BLACKBOARD CHALK leaves heavy deposit of chalk particles on and between discs of Cuno AUTO-KLEAN strainer.

TURNING HANDLE ONE REVOLUTION moves strainer element through comb blades, removing all traces of chalk from between discs. Cuno's exclusive combing operation cleans *thoroughly* —without stopping flow.

FILTERING AREA IS COMPLETELY CLEAN, restoring full initial capacity. All chalk particles and dirt fall to bottom of housing where they can be drained periodically.

- AUTO-KLEAN's permanent metal filter element is available in steel, brass, or stainless steel for long, trouble-free service.
- AUTO-KLEAN is adaptable to any fluid-flow system.
- From acids to tar . . . if you can pump it, Cuno can filter it. Capacities range from one gallon per hour to 15,000 gallons per minute.

CUNO **ENGINEERED FILTRATION**

Removes More Sizes of Solids From More Kinds of Fluids

AUTO-KLEAN (disc-type) • MICRO-KLEAN (fibre cartridge) • FLO-KLEAN (wire-wound)

SINGLE-STRAINER FLUID PROTECTION FOR DIESEL ENGINES

Continuously cleanable AUTO-KLEAN eliminates need for stand-by strainers

Sludge and other contaminants are easily gotten rid of when *all* the lubricating oil is sent through Cuno AUTO-KLEAN strainers. AUTO-KLEAN's compact construction provides this *full-flow* fluid protection in space which would limit ordinary filters to by-pass service.

The low pressure drop of AUTO-KLEAN strainers permits full-flow service on gravity, low pressure, or suction lines, with no loss in operating efficiency.

Cuno's exclusive "comb-clean" action provides *complete* cleaning of the filter element—without stopping fluid flow. Thus there's no need for a stand-by strainer.

The low maintenance costs of the AUTO-KLEAN save you money, for there are no cartridges to change. An occasional rotation of the handle does the cleaning job (most units can be equipped with motor drives for continuous cleaning).

Fixed-space metal discs in this modern strainer positively remove all solids larger than the specified disc spacing—from .0035" up to .062".

For permanent, positive Diesel protection, install compact Cuno AUTO-KLEAN—the precision-built strainer. Send the coupon for free bulletin.

A 3 1

Cuno Engineering Corporation
Dept. 251A, South Vine Street, Meriden, Conn.

Please send me bulletin on Cuno AUTO-KLEAN for Diesel engine protection.

Name.....

Company.....

Address.....

City.....Zone.....State.....

NEW!

EXIDE DIESEL STARTING BATTERY

EXTRA LONG LIFE! This new line of Exide heavy-duty batteries assures you:

QUICK BREAKAWAY
and fast acceleration of engine to firing speed.

LOW DEPRECIATION due to their extra long life.

RUGGED CONSTRUCTION
for rough usage in hard service.

LOW COSTS of operation and maintenance.

OUTSTANDING FEATURES

NEW GRID ALLOY • NEW ACTIVE MATERIAL—G.O.X.
LOWER OPERATING GRAVITIES • NEW DUAL INSULATION

This combination results in longer battery life, lower internal resistance, reduction of standing losses, and sustained battery capacity.

The new Exide also has an improved container and cover, new vibration-proof, heat-resistant sealing compound and new vent plugs.

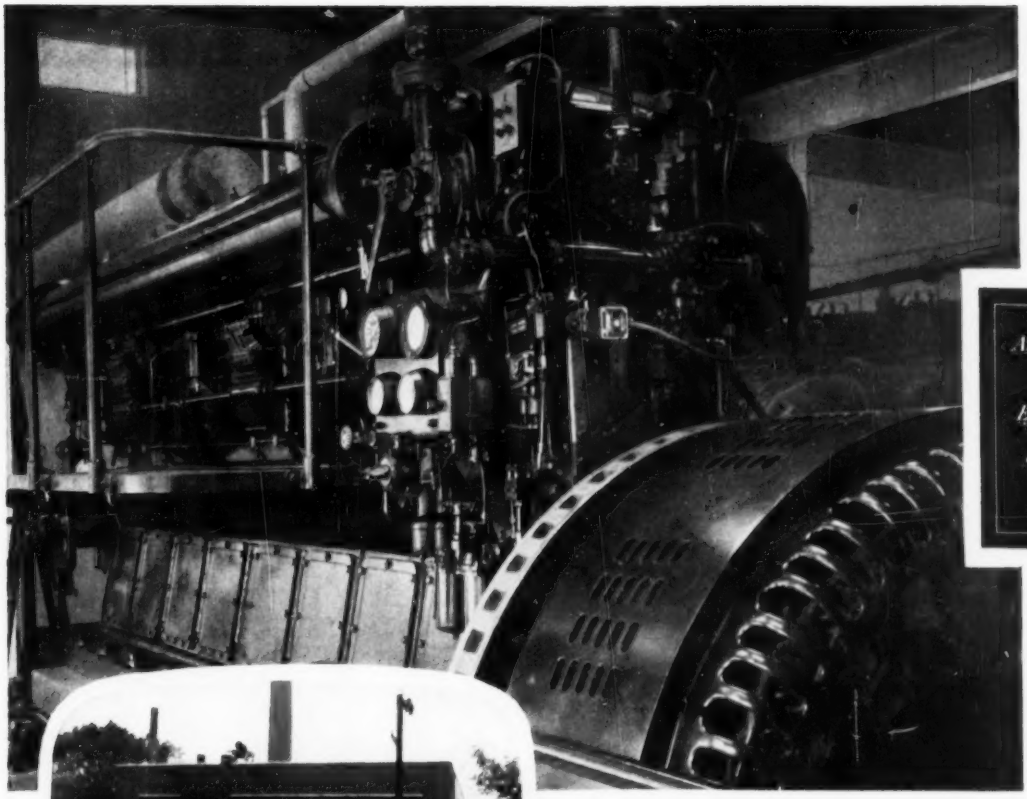
THE ELECTRIC STORAGE BATTERY CO., Philadelphia 2
Exide Batteries of Canada, Limited, Toronto

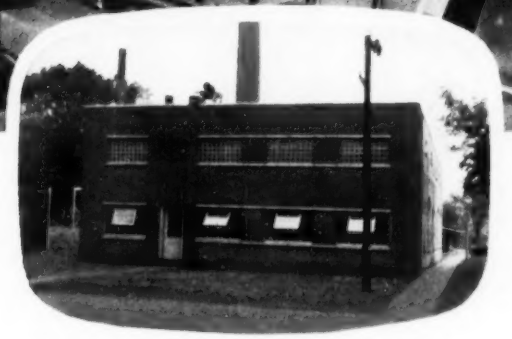
"EXIDE" Reg. T. M. U. S. Pat. Off.

Now, more than ever before

EXIDE IS YOUR BEST BATTERY BUY... AT ANY PRICE

1888 . . . DEPENDABLE BATTERIES FOR 65 YEARS . . . 1953





Tecumseh Electric Plant, Tecumseh, Nebraska, where latest addition is the efficient Cooper-Bessemer gas-diesel shown above.

Why Tecumseh's Cooper-Bessemer Gas-Diesel gets no rest . . .

FOLLOWING conversion from steam to diesel back in 1925, Tecumseh's electric plant has been adding new diesels as load demands grew. Latest is the 8-cylinder Cooper-Bessemer supercharged JS gas-diesel shown here . . . added in 1950.

This engine is kept in virtually continuous operation for 2 simple reasons. First, it has demonstrated the dependability and need for only minimum down time that makes it the logical engine with which to meet base power demands. Second, it's the economical thing to do! Month in, month out, the operating cost has been surprisingly low . . . as low as 3.3 mills per kwh. In plant after plant, Cooper-Bessemer gas engines, diesels and gas-diesels are showing exceptional records of dependability and economy. The nearest Cooper-Bessemer office will be glad to give you interesting facts on actual operation under conditions similar to yours.

The
Cooper-Bessemer
Corporation

MOUNT VERNON, OHIO — GROVE CITY, PENNA.

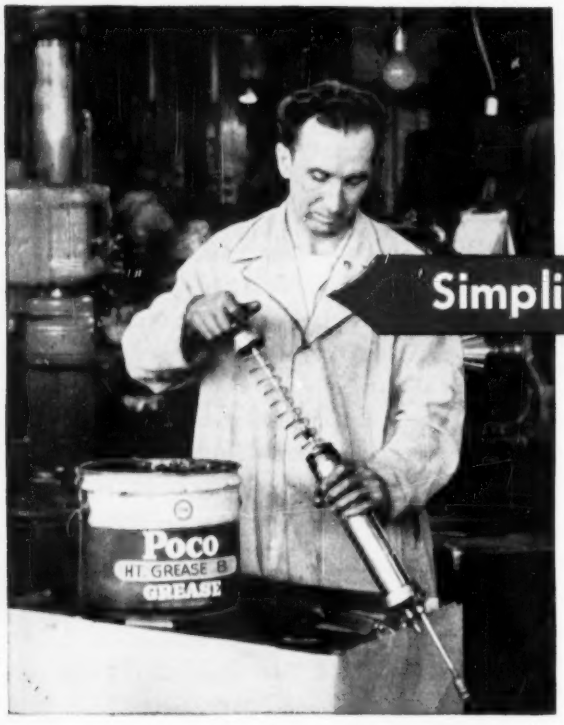
New York City Washington, D. C. Bradford, Pa. Parkersburg, W. Va.
San Francisco Houston, Dallas, Greggton, Pampa and Odessa, Texas
Seattle, Wash. Shreveport, La. St. Louis, Mo. Los Angeles, Calif.
Caracas, Venezuela Gloucester, Mass. Tulsa, Okla. New Orleans, La.

HUNDREDS OF MACHINES—BUT ONLY ONE GREASE!

Read how another manufacturer simplifies and saves with

PURE OIL INDUSTRIAL LUBRICANTS

BE SURE PURE WITH PURE



A large midwestern metal-working plant produces chrome-plated trim (hub caps, grills, etc.) for the automotive industry. All types of metal-working equipment —400-ton presses, shears, drills, lathes, roller-levelers and grinders—are used as well as huge chrome-plating machines. Yet *only one grease*—Pure Oil's POCO HT GREASE B—and one dispenser is used for *all* applications! And in 3 years there has been no down time due to lubrication failures.

Simplify and Save

Here at Pure Oil we specialize in industrial oils and greases designed to do several *different* jobs—instead of one specific job.

And to do each job equally well.

For this reason, our technical experts can nearly always help you to reduce your lubricants inventory . . . simplify your lubricating procedure . . . minimize waste and error.

One of our technical experts will be glad to give you full details, right away. Just call your local Pure Oil office* or write:

THE PURE OIL COMPANY Industrial Sales
35 E. Wacker Drive, Chicago 1, Illinois

Be *sure* with Pure

*Sales offices in more than 500 cities, including: Atlanta, Georgia • Birmingham, Alabama • Charlotte, North Carolina • Chattanooga, Tennessee • Columbus, Ohio • Hattiesburg, Mississippi • Indianapolis, Indiana • Jacksonville, Florida • Madison, Wisconsin • Memphis, Tennessee • Miami, Florida • Minneapolis, Minnesota • New York, New York • Norfolk, Virginia • Parkersburg, West Virginia • Pensacola, Florida • Seaford, Delaware

CHROME

gives unequalled resistance to

HEAT, FRICTION, CORROSION, ABRASION

in the new

Sealed Power

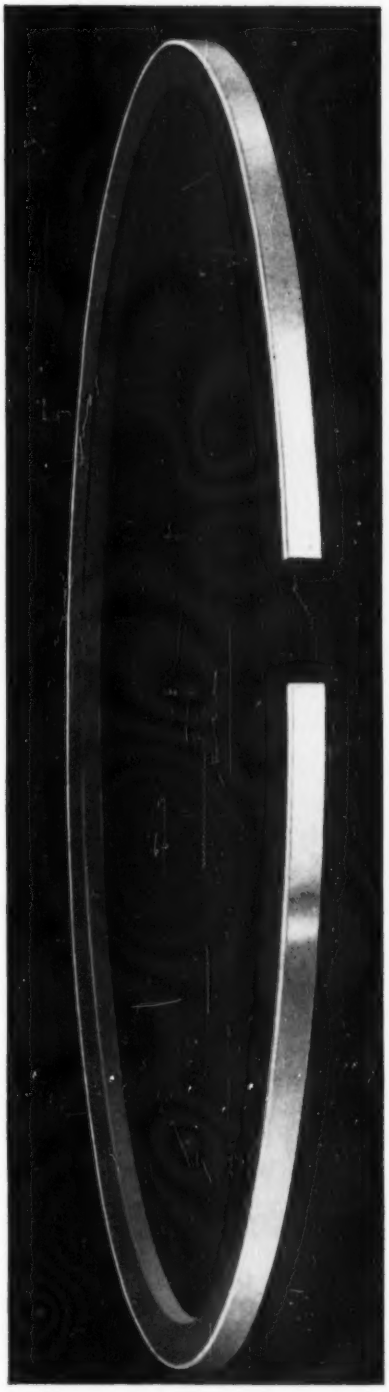
Chrome-Faced

Cyclan

Compression Ring

—plus all these famous Cyclan advantages:

- High tensile strength alloy iron machined to Sealed Power's exacting specifications
- Extreme resistance to property changes under operating conditions
- High impact value for shock resistance
- High resistance to breakage plus ability to undergo considerable distortion prior to fracture without sacrificing resilience
- A structure that assures excellent wear qualities



SEALED POWER MOTOR PARTS

SEALED POWER
CORPORATION
MUSKEGON, MICHIGAN

Write for complete information

Sealed Power

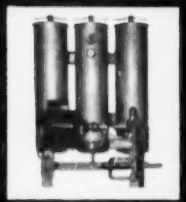
PISTON RINGS · PISTONS
CYLINDER SLEEVES

NOW... the NEW

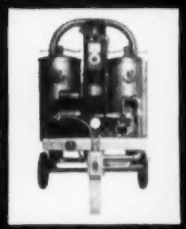
NON - CHANNELING REPACK FILTER

Machined parts provide perfect cartridge seal . . . the only gasket recessed in the head.

Single cartridge unit for automotive and stationary use up to 300 hp.



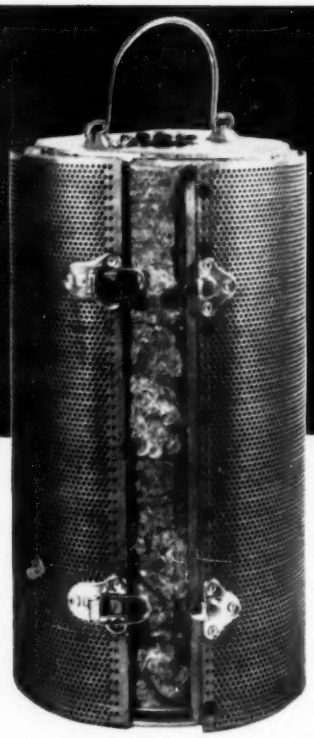
Six cartridge unit with pump and motor used in ratings up to 1800 hp.



Streamlined portable, two cartridge unit with pump, motor and heater. Available in larger capacities.

WRITE

FOR FOLDER AND QUOTATIONS.



ASSURES:

- Cleanest Oil
- Lowest Cost
- Easiest Servicing

In over two years of extensive field use O-P Repack Filters have saved up to 75 percent in filter maintenance.

For the first time, no investment in expensive disposable cartridges is necessary to assure uniform results.

Field and laboratory tests prove that O-P Repacks absorb solids without premature plugging . . . give uniform filtration without voids or channeling.

The split cage with convenient clasps provides quick and easy disposal of contaminated filter material. Re-packed in a matter of minutes. Parts machined to provide perfect seal. Only one gasket, no bolts or springs.

O-P Repack units are available to meet all your requirements. Ask us about Repack cartridges to fit present filters. Let us engineer your next filter installation.

SOME OF THE FIRMS USING O-P REPACK FILTERS:

Oliver Iron Mining Division of U. S. Steel, Duluth, Minn.
Pickands Mather & Co. (Iron Mining Operations), Duluth, Minn.
Moland Brothers Trucking Co., Duluth, Minn.
Border Counties Power Cooperative Inc., Warroad, Minn.
Minnesota & Ontario Paper Co., International Falls, Minn.
General Minnesota Utilities Co., Pine City, Minn.
City of Thief River Falls, (Power Plant) Thief River Falls, Minn.

DULUTH FILTER CO.
2913 W. Superior St., Duluth 6, Minn.

O-P REPACK FILTER
PATENTS PENDING

COPYRIGHT 1952

O-P REPACK FILTER...
Cut your Filtration costs in half!

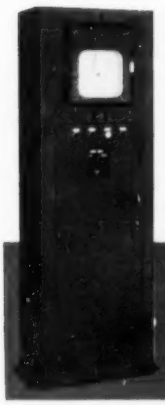
STANDBY ENGINE POWER

Many of the Air Lines have installed automatic engine driven pumps in their hangars at the principal air terminals to insure against failure of water supply in case of fire.

Also, most main air terminals have automatic standby generator sets which will supply current for the lights and control tower within a few seconds, should the commercial source of power fail.

SYNCHRO-START has been making the controls for these power plants for the past twenty (20) years and have the "know how" to build controls that remain dependable. They are in use for every conceivable power application on land, sea, air, and in the mines.

The Universal Automatic Engine Control panel shown, is for fire protection to automatically START-STOP, and give the ALARM when needed and to record the operations including automatic test runs. They are accepted as wholly dependable protection against fire by insurance companies and are in use in a great many of the nations largest industrial, public, and residential buildings.



These panels are manufactured exclusively for Alexander F. Barron, 53 West Jackson Boulevard, Chicago 4, Illinois, who are suppliers of fire protection equipment.

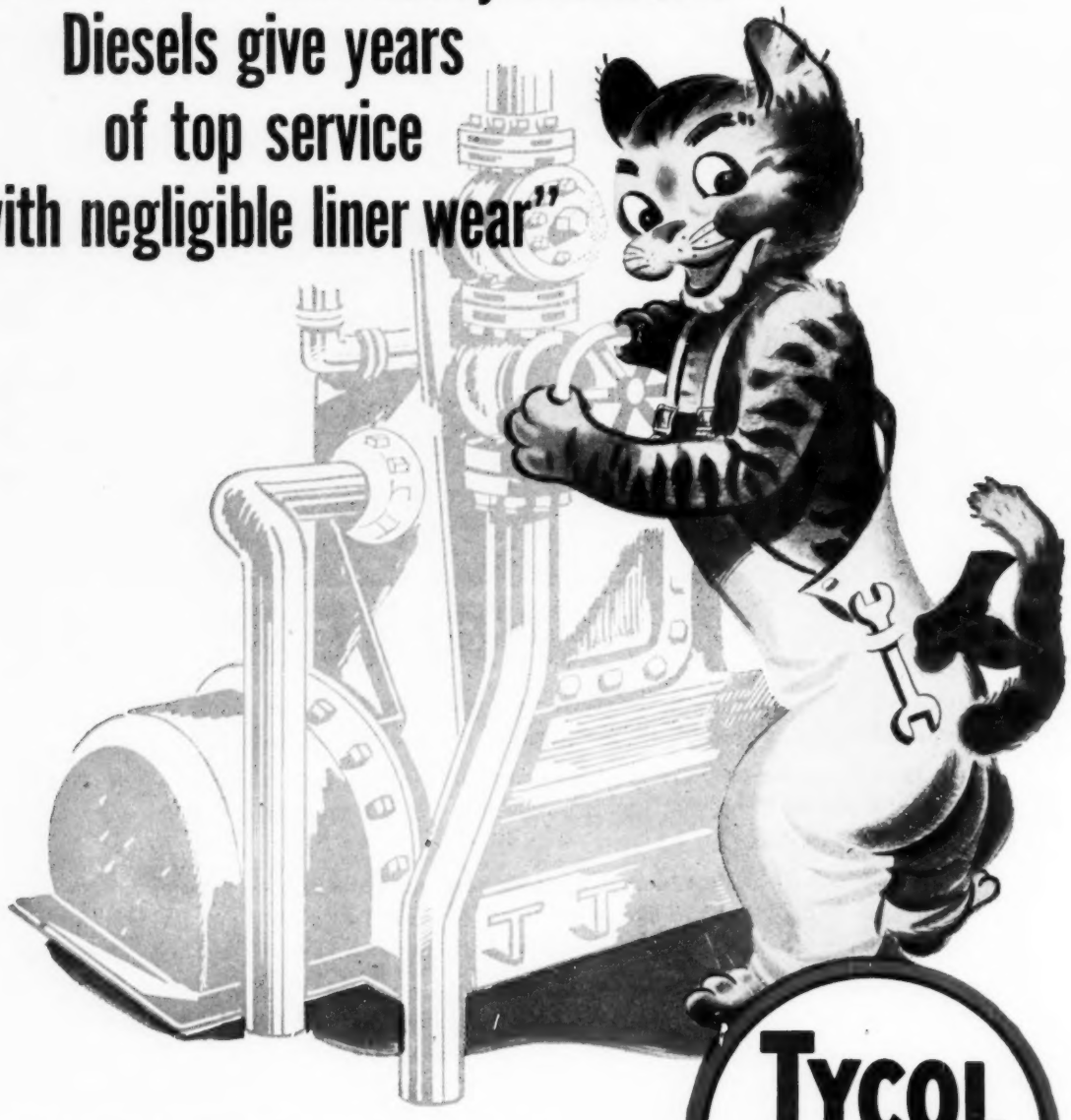
We can furnish controls to meet any application where Gas, Gasoline, or Diesel engine power is used. Write us for our catalog and address of our nearest representative.

SYNCHRO-START PRODUCTS, INC.

Automatic Engine Control Equipment

8151 NORTH RIDGEWAY AVENUE, SKOKIE, ILLINOIS

"Tycol Adelbus cuts costly overhauls... Diesels give years of top service with negligible liner wear"



Exactly! Tycol Adelbus Diesel Oils are fortified with selected additives that provide a tough "film of protection," and help to eliminate sludge and varnish. They have excellent detergent-dispersive characteristics and amazing resistance to heat . . . assure the piston seal that means FULL power and economy . . . and provide exceptional resistance to oxidation.

Complete information about Tycol Adelbus Diesel Oils is available from your nearest Tide Water Associated office. Call or wire now.

TYCOL

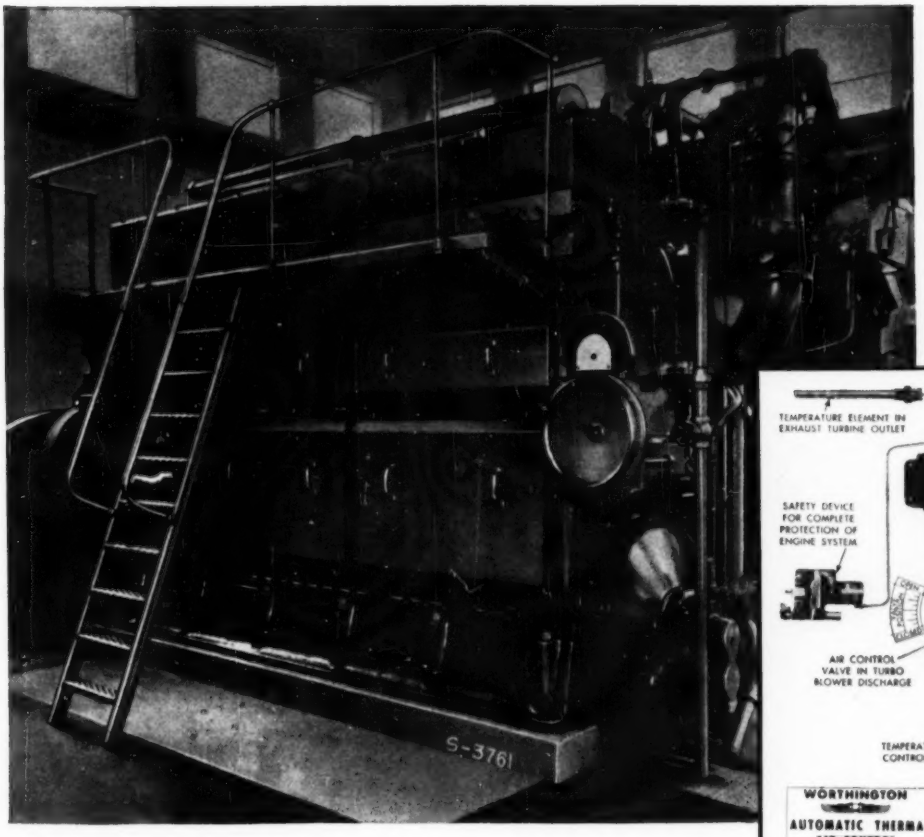
INDUSTRIAL LUBRICANTS

Boston • Charlotte, N. C. • Pittsburgh
Philadelphia • Chicago • Detroit
Tulsa • Cleveland • San Francisco

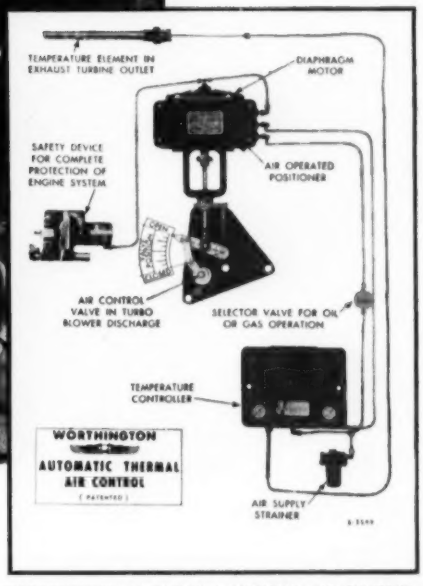
TIDE WATER ASSOCIATED OIL COMPANY

17 BATTERY PLACE - NEW YORK 4, N.Y.

SEND FOR A FREE COPY OF "TIDE WATER ASSOCIATED LUBRICANIA"



HANDLING INCREASING LOADS at the Vermillion, S. D., municipal power plant is this Worthington converted 840-kw dual fuel Diesel engine.


TEMPERATURE ELEMENT IN EXHAUST TURBINE OUTLET
DIAPHRAGM MOTOR
SAFETY DEVICE FOR COMPLETE PROTECTION OF ENGINE SYSTEM
AIR OPERATED POSITIONER
AIR CONTROL VALVE IN TURBO BLOWER DISCHARGE
SELECTOR VALVE FOR OIL OR GAS OPERATION
TEMPERATURE CONTROLLER
WORTHINGTON
AUTOMATIC THERMAL AIR CONTROL
AIR SUPPLY STRAINER

WORTHINGTON AUTOMATIC THERMAL AIR CONTROL supplies correct air-fuel ratio to the engine cylinders *at all times* and *in direct relation to all load changes.*

Vermillion, South Dakota, meets new power demands

In 1949, the City of Vermillion, South Dakota, was faced with the necessity of meeting increased electrical load requirements on its municipal power plant.

To solve this problem, Vermillion plant engineers decided to have their Worthington EE-6 Diesel engine, installed in 1937, converted to a more powerful unit.

Worthington engineered the change-over of the 500-kw naturally aspirated oil Diesel to an 840-kw supercharged dual fuel Diesel—an increase of 340 kw. Engine speed was raised from 327 to 360 rpm.

Now, after a year and a half of heavy-duty operation, the Worthington converted engine has proved to be the most efficient and reliable power producer in the Vermillion plant.

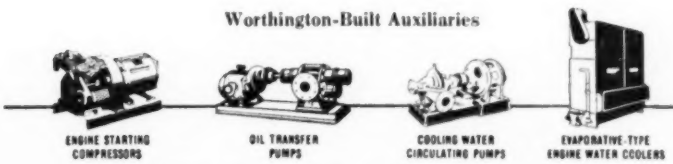
Four of the many exclusive Worthington features that insure top performance of Worthington dual fuel engines are:

1. Worthington automatic thermal air control for improved fuel economy.
2. Worthington dual plunger fuel pump for better, quieter combustion.
3. Worthington micro-metering gas valves—one for each cylinder—for equal cylinder loading and better speed regulation.
4. Worthington helical steel gear train for accurate and positive control of engine timing.

Worthington Corporation, Engine Division, Buffalo, New York.

E.2.5

Worthington-Built Auxiliaries



Economical Continuous Power—Diesels, Oil and Dual Fuel, and Spark-Ignition Gas Engines, from 150 to 2100 bhp.

WORTHINGTON
Engines

$12.00 ALLOWANCE
On Your Old 9" Alco Cylinder Liners

When You Purchase New GUN IRON LINERS

Now Hunt-Spiller offers you the opportunity to replace 9" Alco liners on a money-saving exchange basis. With each order of a new Gun Iron liner, we will allow a credit of $12.00 for a used 9" Alco liner, either plated or unplated, and of any make.

This plan permits you to obtain a *new* cylinder liner free from any cavitation or stress which would ultimately result in fatigue failure—both probable imperfections in a reclaimed liner.

Hunt-Spiller's Gun Iron liners are unplated. Because of its dense, pearlitic structure Gun Iron provides the wear-resistant properties that can only be secured by plating other materials. The wide acceptance of Hunt-Spiller liners by major railroads throughout the country proves their dependability. They are Parco lubrized and service records show quick break-in, reduced oil consumption and long life.

These liners are carried in stock available for immediate shipment.

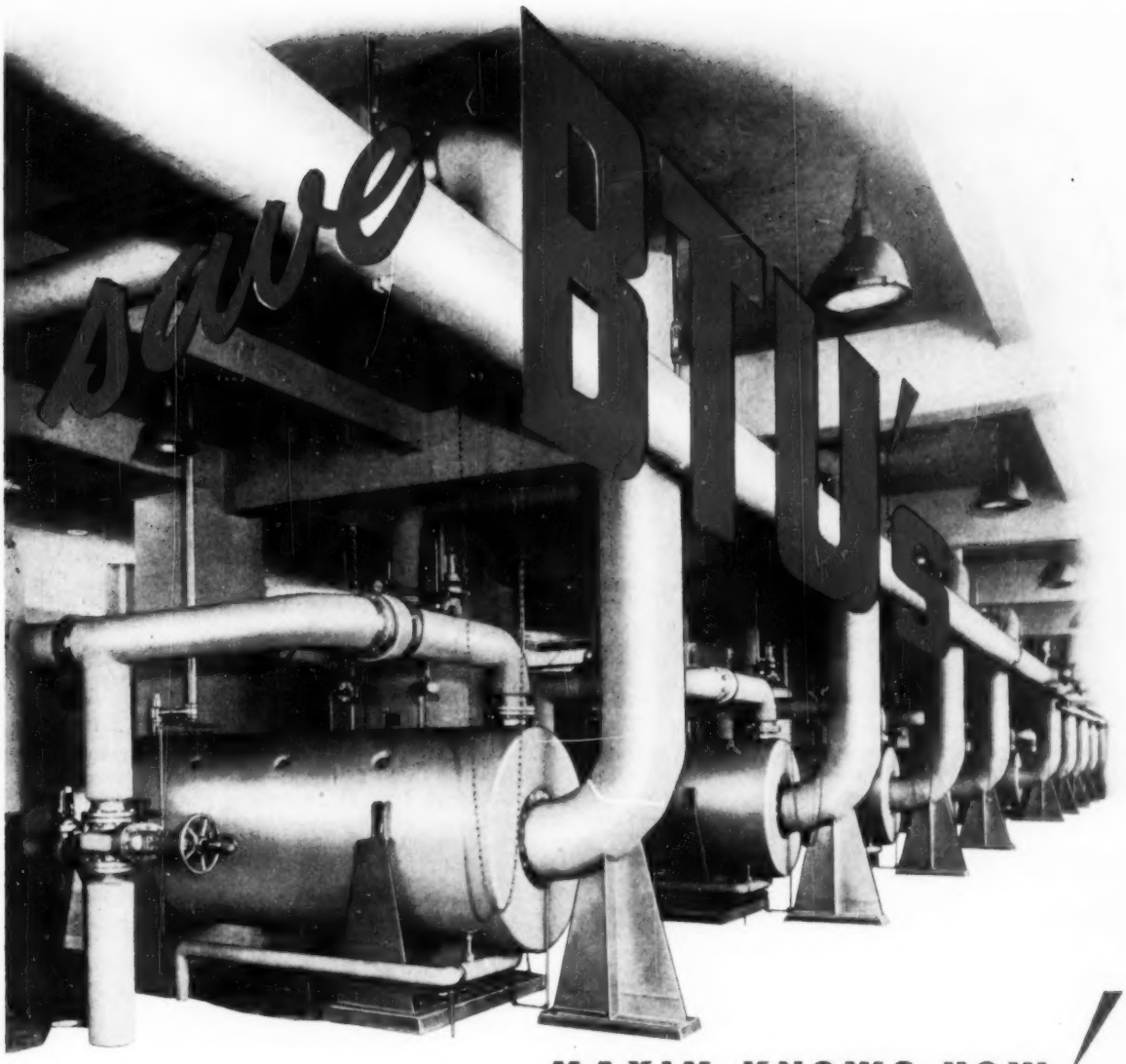
A new catalog of diesel parts currently being produced by Hunt-Spiller is now available. Your copy will be sent without obligation upon request.

HUNT • SPILLER GUN IRON • HSGI • AIR FURNACE PROCESS •

HUNT • SPILLER
MANUFACTURING CORPORATION

373 DORCHESTER AVENUE • SOUTH BOSTON 27, MASS.

Canadian Representatives: Joseph Robb & Co., Ltd., 4050 Namur St., Montreal 16, P. Q.



MAXIM KNOWS HOW!

Maxim Heat Recovery Silencers provide effective silencing of engine exhaust, combined with spark arresting where necessary. In addition, they use the exhaust heat, normally wasted, to produce steam or hot water for heating or processing operations. Shown above is a large sewage disposal plant where substantial savings are effected by Maxim Heat Recovery Silencers, which produce a usable steam supply without adding a dollar to the plant's fuel bills. Maxim engineers will be glad to show you how to make similar savings.

Consult

MAXIM

ON HOW TO SAVE HEAT ➡

THE MAXIM SILENCER COMPANY

DEPT. WL, 93 Homestead Ave., Hartford 1, Conn.

Please send Heat Recovery Silencer Bulletin.

NAME _____

ADDRESS _____

_____

6MX53

THE ENGINEER'S REPORT

DATA

PRODUCT Chevron Starting Fluid

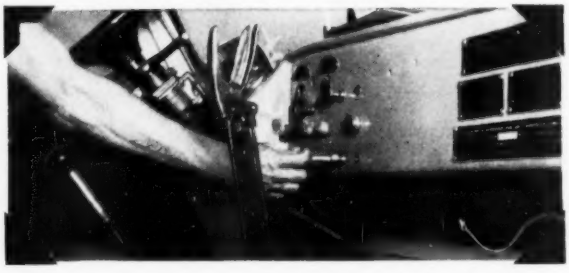
UNITS Diesel engines

CONDITIONS Sub-zero temperatures

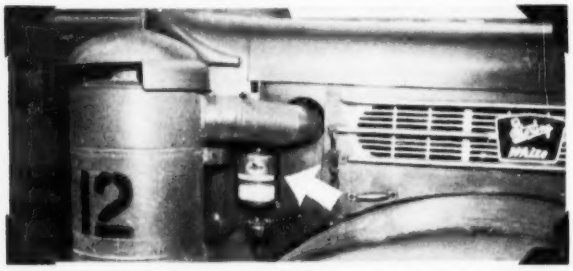
EQUIPMENT Permanent dash-mounted primers—bulk storage tanks

FIRM Picco Logging Co., Montesano, Wash.

Diesels start instantly at 20° below zero!

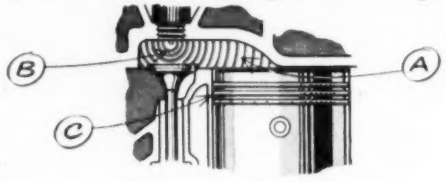


PRIMED WITH CHEVRON STARTING FLUID, diesel engines in Picco Logging Co. trucks "start instantly, even in winter temperatures that sometimes reach 15° and 20° below zero," according to E. W. Picco, owner. Previously, the company lost from 10 minutes to an hour a day in starting each truck. And often, when left out overnight, trucks had to be towed before they would start. The dash-mounted pump shown above is worked once or twice as the engine turns over, forcing fluid through atomizers into manifold.



MOUNTED NEAR THE ENGINE, this storage tank holds bulk Chevron Starting Fluid. It is also available in 7- and 17-CC gelatin capsules. These capsules are placed in a puncturing tool, and fluid is pumped into intake manifold the same way as from the central bulk tank shown. Each type of dispensing equipment is suitable for both diesel and gasoline engine and is available from your starting fluid supplier. Chevron Starting Fluid is approved by leading engine manufacturers.

How CHEVRON Starting Fluid Starts Gasoline and Diesel Engines Instantly



A. Atomizes in lowest temperatures and provides powerful, easily ignited vapor in combustion chamber.

B. Pressure, or the weakest spark, fires mixture—turns engine and heats air for regular fuel mixture.

C. Contains lubricant and additives—inhibits cylinder wear, and ice formation in primer equipment.

HOT NEWS FOR COLD ENGINES

FREE BOOKLET gives you more facts on Chevron Starting Fluid—shows where it should be applied in different type engines. Write or ask for it today.

CHEVRON STARTING FLUID

TRADEMARK REG. U.S. PAT. OFF.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA • San Francisco 20
THE CALIFORNIA OIL COMPANY • Barber, New Jersey
STANDARD OIL COMPANY OF TEXAS • El Paso
THE CALIFORNIA COMPANY • Denver 1, Colorado

SHARPLES
Centrifugal Oil Purifiers

COMPLETE SELF-CONTAINED UNITS

Only 15 Minutes to Clean

TO PURIFY HEAVY FUELS FOR USE IN DIESEL ENGINES

For over 20 years, Sharples equipped vessels have been successfully using *Bunker C* and *other heavy oils* as a diesel engine fuel. The Sharples Heavy Fuel Purifier continuously and effectively removes unburnable solids and water—the purified oil meets ASTM ash content specifications; engine efficiency is excellent, and maintenance is low. Large savings in fuel are made possible by the use of these low cost oils.

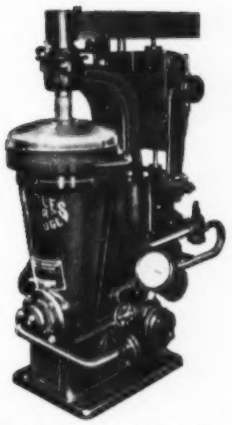
TO PURIFY LIGHT FUEL OIL

Sharples Light Oil Centrifugal Purifiers remove tank scale, dirt, water, and other impurities from light fuels giving assurance that nozzle feed and combustion efficiency are unimpaired. Sharples AE-V and AE-VH Purifiers meet U. S. Navy requirements.

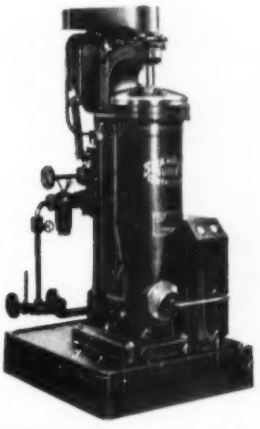
TO PURIFY DIESEL AND TURBINE LUBRICATING OILS

Water, sludge, and other impurities are quickly removed by the Sharples Oil Purifier—thereby eliminating emulsions, abrasives, and other harmful matter in lubricating oils.

There are only 3 moving parts to the Sharples bowl assembly which reduces cleaning to 15 minutes or less.



The TYPE AE-V is indicated where heating of the oil is unnecessary or where heating is to be done by a separate steam heater. The VP En Bloc is complete with motor which drives both the centrifuge and the intake and discharge pumps, motor control, thermometer, pressure gauge, strainer and all integral piping. The VP En Bloc is available in five sizes with capacities up to 450 g.p.h.



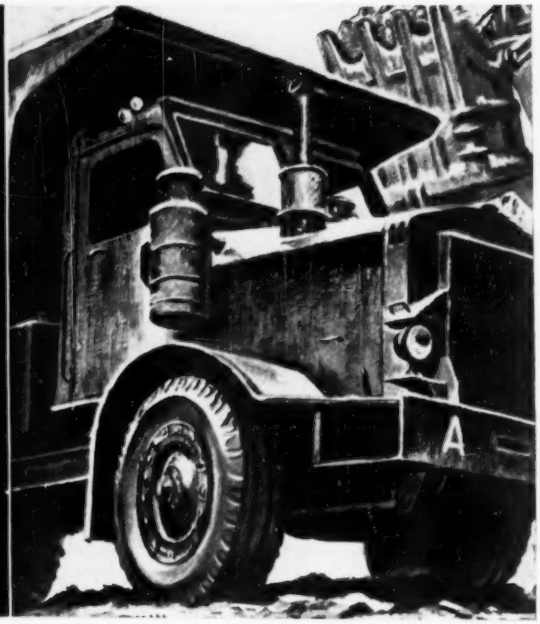
The TYPE AE-VH is recommended where it is desirable to heat the oil by means of electric heaters. The electric heaters are built into the units and are equipped with automatic temperature control. One motor drives both the centrifuge and the intake and discharge pumps. This unit is complete with strainer thermometer, pressure gauge, heaters and all integral piping. Available in five sizes with capacities up to 450 g.p.h.

SHARPLES

THE SHARPLES CORPORATION • 2300 WESTMORELAND STREET, PHILADELPHIA 40, PENNA.

NEW YORK • BOSTON • PITTSBURGH • CLEVELAND • DETROIT • CHICAGO • NEW ORLEANS • SEATTLE • LOS ANGELES • SAN FRANCISCO • HOUSTON

You Can Extend Life of ENGINES, TRANSMISSIONS and DIFFERENTIALS



With Allison Torqmatic Drives

BASED on user records, heavy-duty trucks equipped with Allison TORQMATIC CONVERTERS and TRANSMISSIONS *last longer and cost less to operate* than trucks with mechanical drives.

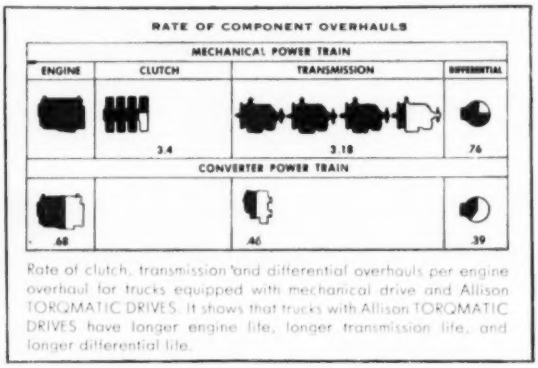
Records show that Allison TORQMATIC DRIVES boost truck availability, enabling operators to improve their schedules and, thus, they can do more business.

Trucks — and other heavy equipment — with Allison TORQMATIC DRIVES use the flexibility of the converter to start heavy loads and make shock-free gear-shifts at full power. The Allison TORQMATIC DRIVES automatically balance engine power with the load requirement. This automatic operation makes the driver's job easier and reduces wear on the whole unit—thus cutting maintenance cost.

You are interested! Attach this advertisement to your letterhead and send it to Allison. You will receive detailed evidence on what these Allison TORQMATIC DRIVES will do for you.

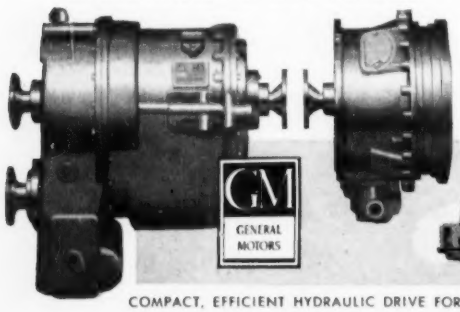
And the next time you're ordering heavy-duty equipment, you'll ask your dealer or manufacturer for units with Allison TORQMATIC DRIVES.

ALLISON *Division of* GENERAL MOTORS
Box 894SS, Indianapolis 6, Indiana



Rate of clutch, transmission and differential overhauls per engine overhaul for trucks equipped with mechanical drive and Allison TORQMATIC DRIVES. It shows that trucks with Allison TORQMATIC DRIVES have longer engine life, longer transmission life, and longer differential life.

MATCHED UNITS BUILT BY ONE MANUFACTURER



Allison TORQMATIC DRIVES

COMPACT, EFFICIENT HYDRAULIC DRIVE FOR TRUCKS * CRANES * TRACTORS * SHOVELS * DRILLING RIGS

This FREE Lab Service Saves You Money

Ashland special DIESEL fuels and lubricants

Services of the above Ashland Oil laboratory for testing oil and lubricants is available, without charge, to users of Ashland, Valvoline and Enarco products. Here is a valuable aid to all operators of diesel engine, truck fleets, railroad and marine equipment who furnish samples of used oils for tests. It will help keep your diesel equipment on the job, operating efficiently and economically.

Phone or write our nearest office and learn how our engineering department can help you — and save your dollars.

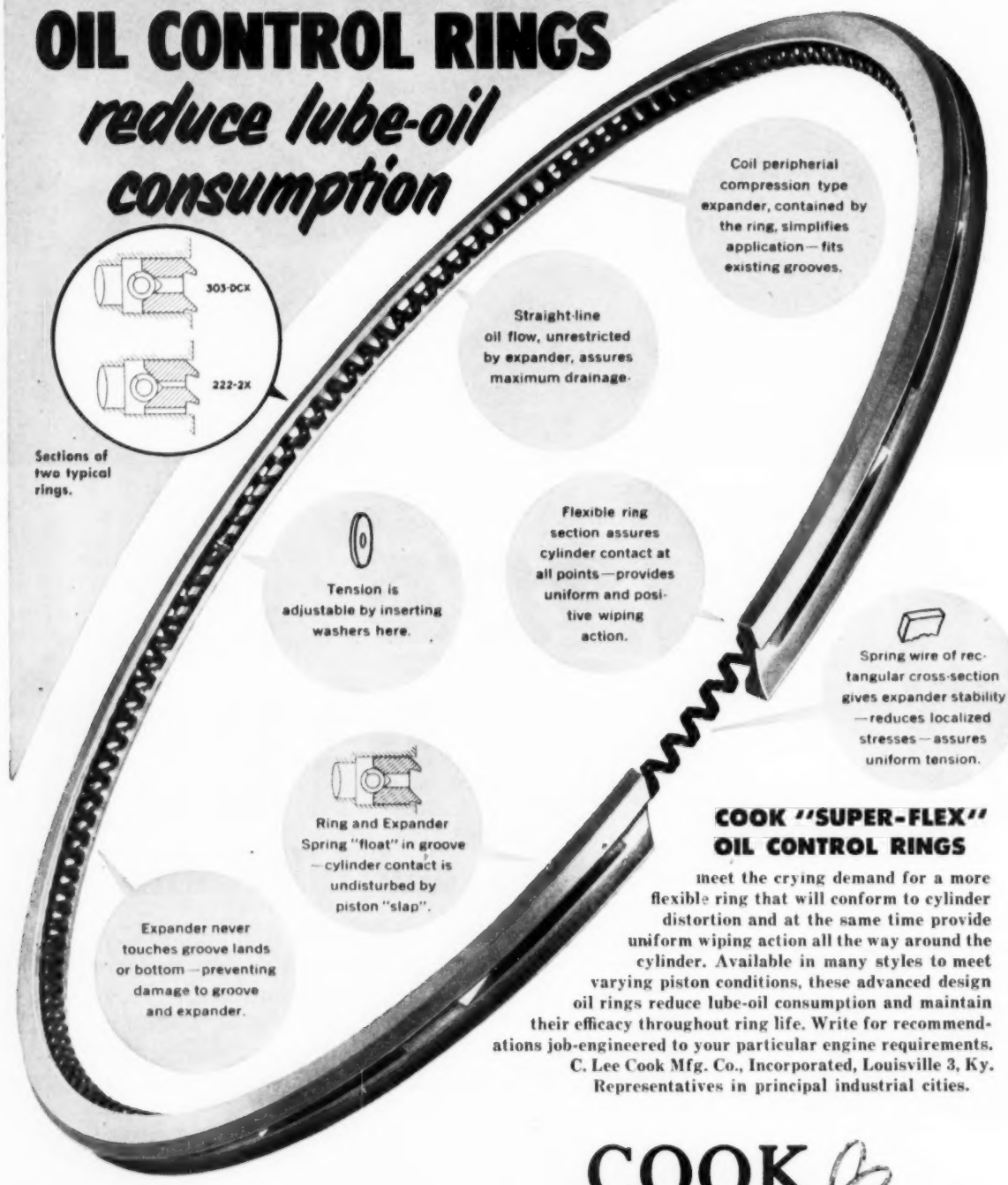
ASHLAND OIL & REFINING COMPANY

ASHLAND, KENTUCKY

SUPPLY TERMINALS: Ashland, Ky. — Buffalo, N. Y. — Canton, O. — Cleveland, O. — Evansville, Ind. — Findlay, O. — Freedom, Pa. — Kenova, W. Va. — Louisville, Ky. — Marietta, O. — Nashville, Tenn. — Niles, O. — Paducah, Ky. — Pittsburgh, Pa. — St. Louis, Mo. — Toledo, O.

Why COOK "SUPER-FLEX" OIL CONTROL RINGS reduce lube-oil consumption

Sections of two typical rings.



Coil peripherial compression type expander, contained by the ring, simplifies application—fits existing grooves.

Straight-line oil flow, unrestricted by expander, assures maximum drainage.

Flexible ring section assures cylinder contact at all points—provides uniform and positive wiping action.

Tension is adjustable by inserting washers here.

Spring wire of rectangular cross-section gives expander stability—reduces localized stresses—assures uniform tension.

Ring and Expander Spring "float" in groove—cylinder contact is undisturbed by piston "slap".

Expander never touches groove lands or bottom—preventing damage to groove and expander.

COOK "SUPER-FLEX" OIL CONTROL RINGS

meet the crying demand for a more flexible ring that will conform to cylinder distortion and at the same time provide uniform wiping action all the way around the cylinder. Available in many styles to meet varying piston conditions, these advanced design oil rings reduce lube-oil consumption and maintain their efficacy throughout ring life. Write for recommendations job-engineered to your particular engine requirements. C. Lee Cook Mfg. Co., Incorporated, Louisville 3, Ky. Representatives in principal industrial cities.

COOK
PISTON RINGS

. . . SEALING PRESSURES SINCE 1888 . . .

DIESEL POWER
AND DIESEL TRANSPORTATION

Brian P. Emerson, *Editor* — John H. Wetherell Jr., *Associate Editor*

C. W. Kinnear, *Special Railroad Representative*

Established in 1923

GEORGE R. BRIGHTON
President

JAMES E. JONES
Vice President & Treas.

G. RENFREW BRIGHTON
Vice President & Sec'y.

ARNOLD B. NEWELL
Vice President

ARTHUR N. GODING
Business Manager

HERBERT C. SPENCER
Circulation Mgr.

M. D. PUGH
Pacific Coast Manager
2721 North Marengo Ave.
Altadena, Calif.
Sycamore 7-2894

NEWSPAPER REPRESENTATIONS, LTD.
British Representative
231, Strand,
London, W. C. 2, England

Subscription Rates

	Single Copies	1 year	2 years	3 years
U. S.	35¢	$3.00	$5.00	$ 6.00
Canada	40¢	4.00	7.00	9.00
Foreign	40¢	5.00	8.00	11.00

Diesel Power & Diesel Transportation is indexed regularly by Engineering Index, Inc. and is available in microfilm editions from University Microfilms, Inc., Ann Arbor, Michigan.

January, 1953

Vol. 31, No. 1

Cover Photo: Four Caterpillar D8 tractors form a cable train for laying long distance telephone cable over a 25-mi. section near cummings, California, at 4500-ft. elevation.

EDITORIAL

Public Relations in Municipals 29

ARTICLES

Diesel Engine Prospects for 1953 32
Now About Antifreezes 36
Diesel Power in the Delta Country 39
Waukesha Turbocharges Diesels 40
Cleaning Sharples Centrifuge Bowls 44
Detroit Diesel's 51 Series Engines 46
Maintaining Traction Motor Bearings 74
National Supply's Lister Diesels 79

BUYERS' GUIDE

A convenient and comprehensive listing of engines, accessories, equipment and services for the diesel industry, with the names and addresses of manufacturers 47

DEPARTMENTS

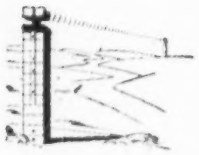
Highlights 31
What Do You Know! 38
Straight from the Tool Box 80
New Products 82
Field Notes 92
Consolidated Index for 1952 104
Ad Index 106

Diesel Publications, Inc., 192 Lexington Avenue, New York 16, N. Y.

Diesel Power and Diesel Transportation is published monthly at Orange, Conn., by DIESEL PUBLICATIONS, INC., 192 Lexington Ave., New York 16, N. Y. Tel. Murray Hill 3-9874. Cable address: Dieselpub, N, Y. Subscription Prices: United States, $3.00 per year; Canada, $4.00; Foreign, $5.00. Single copies, United States, 35c. Bound volumes by previous year, $15. Subscribers are requested to send both the old and new addresses when ordering change in mailing.

Copyright, 1953 Diesel Publications, Inc.

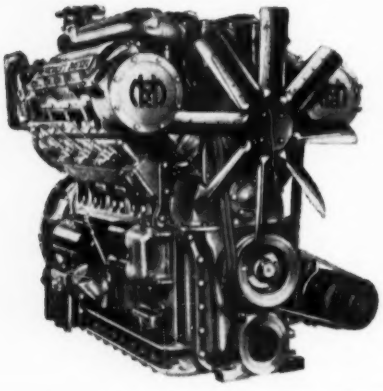
if your job requires:

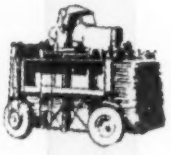


DEPENDABLE service
SMOOTH power
ECONOMICAL operation

specify

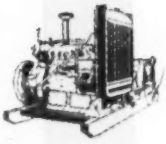
HERCULES DIESELS





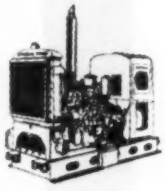
THE WIDE ACCEPTANCE of Hercules lightweight, high-speed, heavy-duty diesel engines is the result of sound engineering principles and engine building "know-how."

This wide acceptance has gained an enviable reputation for Hercules diesel engines throughout all phases of industry which has resulted in many diversified applications in the automotive field . . . agricultural industry . . . construction industry . . . industrial service . . . oil field service . . . marine use and many others.



There are 29 models of Hercules diesel engines, built in a broad range of sizes and displacements from 12 to 500 horsepower. Hercules diesel engines are available with either automotive mounting or as closed, open or base type power units and are parallel in mounting dimensions and performance with Hercules gasoline engines of similar displacement.

For power requirements such as those illustrated or other applications where dependable service, smooth power and economical operation are important factors—specify Hercules diesel engines—produced by engine specialists who have been designing and producing engines to industries specifications for over 36 years. *If you have a special power problem, write the factory or call in a Hercules sales-engineer.* We will be glad to discuss your power requirements with you. No obligation, of course.



HERCULES MOTORS CORP. • Canton, Ohio, U. S. A.

Engine specialists since 1915

TWO CYLINDER

Model	Bore and Stroke Inches	Piston Displ. Cubic Inches	Max. H.P. at R.P.M.	Max. Torque at R.P.M.
DJXC	4" x4½"	113.1	27.6 @ 1800	81 @ 1400
DJXD	4½ x4½"	127.5	30 @ 1800	91 @ 1300

FOUR CYLINDER

DJ4B	3½ x4	133	46 @ 3000	96 @ 1500
DJ4D	3⅝ x4	166	57 @ 3000	120 @ 1500
DOOB	3⅝ x4½	198.8	63 @ 2600	142 @ 1400
DOOC	4" x4½"	226.2	70 @ 2600	162 @ 1400
DOOD	4½ x4½"	255	79 @ 2600	183 @ 1400

SIX CYLINDER

DJ6D	3⅝ x4	348	93 @ 3000	194 @ 1800
DJ6B	3½ x4½	360	77 @ 2600	178 @ 1300
DJ6C	3⅝ x4½	398	85 @ 2600	208 @ 1300
DJ6H	3⅝ x4½	398	99 @ 2600	234 @ 1400
DJ6HF	3⅝ x4½	398	99 @ 2600	234 @ 1400
DW6C	4" x4½	508	120 @ 2600	276 @ 1300
DW6D	4½ x4½	604	133 @ 2600	315 @ 1600
DW6LD	4½" x5"	636	142 @ 2600	328 @ 1600
DW6LDF	4½" x5"	636	142 @ 2600	311 @ 1500
DR6B	6⅜ x5½"	674	133.8 @ 2200	360 @ 1200
DR6C	6⅜ x5½	839	147 @ 2200	400 @ 1100
DF6B	5" x6"	707	190 @ 2100	330 @ 1350
DF6C	5½ x6"	779	204 @ 2100	385 @ 1350
DF6D	5½ x6"	855	217 @ 2100	643 @ 1350
DF6E	5⅝ x6"	893	228 @ 2100	683 @ 1350
DF6N	5⅝ x6"	933	240 @ 2100	750 @ 1200
DF6NF	5⅝ x6"	933	240 @ 2100	730 @ 1300

EIGHT CYLINDER

DMEV-8C	5" x6"	1348	363 @ 2100	1010 @ 1200
DMEV-8D	5½ x6"	1468	400 @ 2100	1100 @ 1200
DMEV-8DS	5½ x6"	1468	360 @ 2100	1330 @ 1300

Editorially Speaking . . . .

Public Relations in Municipals

Last month we reported concerning the situation in Sebawaing, Michigan. This village has its own municipal power plant —has had for over 40 years. They need a new engine to provide firm power to meet the growing usage of electricity. So, they ordered an engine.

Detroit Edison wants to sell the village its power. They sought, without success, to influence the people in favor of purchasing power.

A recent editorial on the front page of the local newspaper, THE SEBAWAING BLADE, expressed the predominant feeling in the community. The issue was: Their own power plant versus purchased power with its demand charges plus energy costs. The heading was apt—"When you buy it, you own it; but when you rent it, you just pay and pay."

In short, the community has faith in their power plant and the judgment of their officials. They are not afraid to obligate the money required for so sound an investment. They take pride in ownership and in running their own affairs—an old American tradition.

Now, whence comes this faith? It's very simple; the plant is doing a good job and the people know about it! This situation involves two jobs: good plant operation and Public Relations.

Public Relations is just plain common sense, a sort of "laying the cards on the table". When you are doing a good job, tell the people about it. When things go wrong, tell them about it, too. Let them know the whys and wherefores—and most important—what you plan to do about it. Take them into your confidence.

They must be made to feel they *are* on the team; after all, it *is* their plant and their community. But the American people are notoriously lax with respect to civic affairs, so means must be found to create an awareness of what's going on and the benefits that accrue.

The techniques are simple. Let's start with the Annual Report. It should get widest possible distribution and tell something. Use simple graphs and charts to literally show the people what's what.

Above all, point out benefits to the community that would otherwise affect the tax structure. Payments in lieu of taxes and free street lighting are some common examples. Light and power bills generally do not tell the whole story even though rates are favorable.

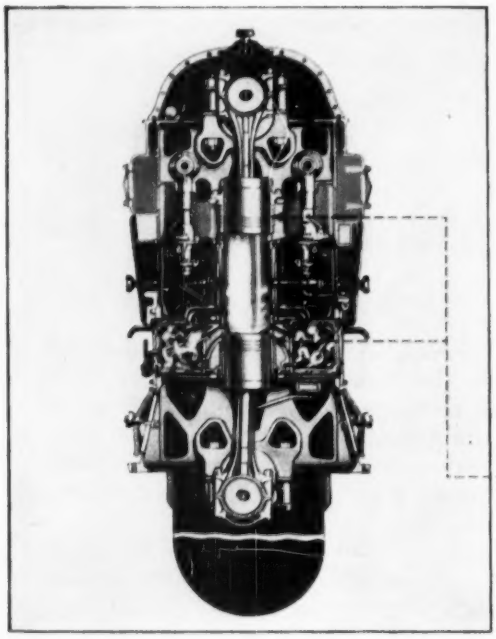
Why not send along a brief message with the bills telling of some service rendered or perhaps some new development. Many large utilities do this regularly. Enlist the aid of the local press and radio station in publicizing newsworthy information of the plant.

Then there are the personal contacts. All village officials should be thoroughly conversant with the plant operation and never lose an opportunity to spread the word, particularly among community opinion leaders. Let the people visit the plant; perhaps have an open-house periodically.

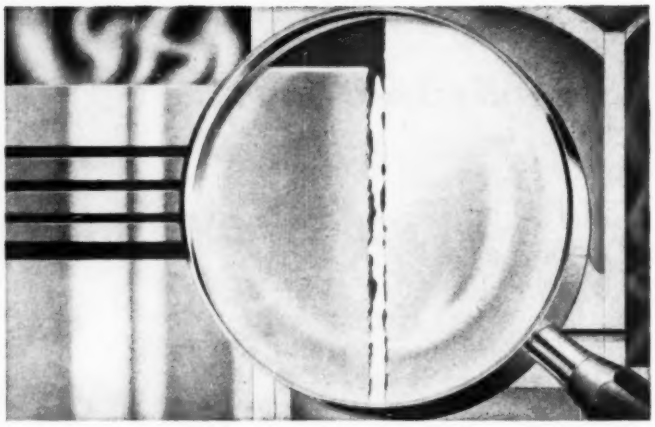
These are a few of the techniques. Simple things, and yet you can gain the confidence and good will of the people. Sebewaing did it and look at the unity of purpose that was achieved.

The people know their plant and they want it. The village officials and the superintendent of the plant, Harold Wagner, can take a well-deserved bow.

Getting the people on your team may take a little doing but it is well worth the trouble. Think it over.

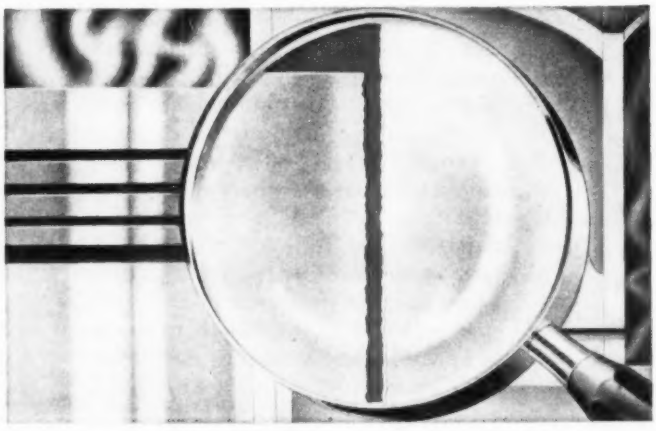


←That demon friction... not only at the points indicated here, but with all moving parts throughout any engine . . . can steal up to 50% of the power produced by your fuel.



↑ *Drawing above* illustrates how inferior diesel oils . . . oils with weak film strength and less free-flowing qualities . . . provide insufficient lubrication and set up friction points.

↓ *Shown below* is the complete coverage Cities Service D-C Oils provide. They provide a strong, adequate oil film, a positive seal between piston rings and cylinder walls.



POWER LOSS DUE TO FRICTION must be held to a minimum

Much of the power generated by any motor fuel is wasted in overcoming friction. But this loss must, and can be held to a minimum with the proper lubricants . . . Cities Service Diesel Lubricants.

With exceptionally high film-strength and free-flowing qualities, Cities Service Diesel Oils provide a perfect oil film between all moving parts and thorough lubrication of the most intricate diesel mechanisms under severest operating conditions. They reduce power-stealing friction to the barest minimum.

Be sure you're getting all the power your diesels were designed to give. Use the complete line of Cities Service D-C Oils. Ask your Cities Service Representative, or call the office nearest you.

CITIES SERVICE DIESEL OILS ALSO:

- **Minimize wear under all conditions.**
- **Provide a positive seal between piston rings and cylinder walls.**
- **Serve as a coolant to fight heat.**
- **Clean as they lubricate.**

CITIES SERVICE

+ HIGHLIGHTS +

● From February 9 through 11, the American Road Builders Association will hold their 1953 annual meeting at the Hotel Statler in Boston.

● Last year, more than 17 billion glass containers were produced and nobody thought anything of it. This we hear from "Steelways."

● AAR tells the cost of an all-steel air conditioned passenger coach is in the neighborhood of $125,000 and a Pullman approximately $163,000.

● GM announced recently it will hold its own automobile show at the Waldorf-Astoria Hotel in New York from January 17 to 23.

● According to the Census Bureau, by 1975 we will be a nation of 193 million people with about 1/3 more automobiles and double the number of trucks now in use.

● New York City's Board of Transportation is currently complaining about its electric bills—maybe municipal power would answer their problems.

● Delco-Remy Div. of GM recently announced its plans to construct a west coast storage battery plant. When completed, it will build Delco automotive batteries to help meet expanding demand in the area.

● Robert C. Dunlop, president of the Sun Oil Company, Philadelphia, announced recently that a new pipeline between Sarnia and Toronto is scheduled to begin operation in the fall of 1953. Initial capacity will be about 39,000 bbl per day.

● From the cross ties in the railroad to switch and bridge ties, . . . If set to music, this would sound like what might be expected of a popular singer. However these lyrics are played to the tune of $133 million. That's what Class I railroads paid for lumber and wood products in 1951.

● The Erie Railroad announced recently that all freights are now dieselized.

● Construction of better roads means the use of more diesel powered equipment—both in road construction and highway transportation.

● GMC announces a new expansion of diesel service training with the reopening of their diesel service school at Oakland, California.

● Recently, Canadian National Railways ordered 300 new passenger units which will cost approximately $50 million.

● GM recently announced its intention to give $194,000 in prizes for the best solutions to our highway problems. Contact your local GMC dealer for contest entry forms.

● AIEE will hold its winter general meeting at the Hotel Statler, New York, from January 19 to 23.

● Union Pacific recently ordered 15 gas turbine locomotives from GE, which will bring UP's gas turbine locomotives to 25 when the orders are completed.

● Alcoa announces its plans to erect a modern fabricating plant in the Lancaster, Pa. area. Production at the new plant probably will include aluminum screw machine products, fasteners, rivets, and nails.

● The Department of Commerce survey on Markets, after the defense expansion, is a strongly encouraging factor in the outlook for heavy industrial equipment markets through 1955, states the Council for Technological Advancement in a recent bulletin.

● S. M. Blair, vice president of Trans Mountain Oil Pipe Line Co., Toronto, Canada, stated that Canada's crude oil production may reach a rate of 300,000 bbl per day during the summer of 1953.

● The Canadian Pacific Railway Co. placed orders for 73 diesel-electric locomotives with Montreal Locomotive, Canadian Locomotive, and GM Diesel.

● From the B&O Railroad, we hear that the first night train ran on this road through West Virginia in 1848. The trains were lit by wax candles.

● According to the Aluminum Association, power shortages have cut production of primary aluminum for the second straight month—you don't need rain to get power from diesels.

● As of December 1, 1952, there were 87,657 freight cars on order and undelivered.

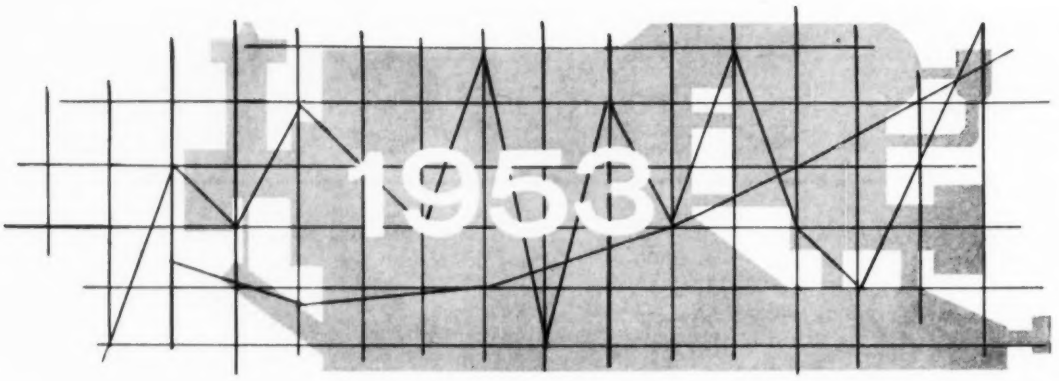
● Caterpillar tells us that without a filter, 3 oz of dust in an engine's crankcase can wear out the engine in 1000 hr. Looks like filtering pays off.

● At the Dunmore Car Shop on the Erie road, a freight car rolls off the assembly line every 70 min. This means that seven cars are completed every day.

● Railway expenditures for additions and improvements reached an all-time high during the 5-yr period ending December 31, 1951. Expenditures during this period averaged $3,892,000 for every working day.

● Mr. D. H. Teetor, chairman of the Automotive Service Industries Show, predicts that 1953 will be a record year for automotive servicing, with $2 billion to be spent for replacement parts.—Will '53 be a record year for diesel replacement parts?

● The value of medical supplies and equipment being stockpiled by federal, state, and local governments and private agencies for civil defense use in case of emergency reached $90 million by mid-1952. Standby and mobile power units are also essential. Is the diesel aid getting its share?



Diesel Engine Prospects

By Peter B. B. Andrews

Economist, Future Sales Ratings

Here is the second yearly presentation of what is believed to be the most authentic data available with respect to the number of diesel engines built in this country along with their end-uses. Last year, Dr. Andrews forecast the production of 141,667 engines "tempered by the question of availability of materials". Refigured at about the end of the Third Quarter, indications were that production would fall short by about 17,672 units. Not bad in view of the unstable materials situation that persisted through 1952!

This year, Dr. Andrew's figures are predicated on the basis of the revised figures for 1952. The outlook is encouraging.

About the author—Dr. Andrews has had a long and successful career as a marketing economist and statistician. He rendered important services to the government during World War II and is a standby economic advisor to several U. S. Government agencies. As economist of *Future Sales Ratings* and consulting economist to *Sales Management*, he has conducted marketing surveys for the 100 leading industries of the country with a forecast accuracy of 86 per cent, a record maintained by last year's survey.

Considerable expansion of diesel engine sales in 1953 over the year 1952 is visualized by the 300-man board of analysts of Future Sales Ratings. This is contingent on the industry's degree of application of ingenuity with the use of scarce materials, no materialization of World War III, and the employment of aggressive marketing techniques.

An increase of 15 to 25 per cent in production and sales is visualized this year over the year 1952, subject to the contingencies mentioned. The most emphasized consideration in this optimistic appraisal of the diesel engine industry's sales prospects is a comparatively good general prospect which, significantly in the present armament-and-high-labor-cost economy, requires efficient and inexpensive power sources such as provided by diesel engines.

What Happened Last Year?

In the 1952 report the Board, assuming that there would be no major world war, predicted that the armament program as planned was impractical and would be stretched out to free materials for other uses. They contended that maldistribution was creating artificial shortages even though the supply was tight in some categories. They further contended that some relief would be obtained from new capacity. Application of ingenuity in substitution of less critical materials was foreseen as affecting the materials availability picture.

All of these forecasts were nicely fulfilled with the final tally for the year favorable in view of the many handicaps. The situation improved so rapidly that in the Third Quarter of 1952, two of the major controlled materials—copper and aluminum—went off the "most critical" list. Steel would most certainly have followed if it were not for the long-drawn-out steel strike, an unforeseen calamity.

New capacity is having its effect. New aluminum plants have been placed in operation and the immediate shortage eased by material loans from Canadian sources through agreements with Britain. There is improvement in copper supply of which a year ago, experts talked in terms of a 5- to 10-yr. shortage, some saying it might never again be plentiful. Steel plants are about back to normal and the new U. S. Steel Fairless plant will open shortly.

There is by no means enough copper, steel, and aluminum to meet requirements at present and allocations, of course, are still highly restrictive, but the supply trend is

considered by the Board to be most encouraging. Substitutions and "design-around" techniques are already in evidence and will further aid the supply situation of critical materials. All these are factors influencing the Board's thinking for 1953.

Some Look-Ahead Factors

In looking back at some of the factors that influenced last year's production, it is inevitably concluded that they will carry over to influence 1953 production and sales. Analysis of expansion goals in segments of industry as well as the raw material field helps to determine trends.

Quantitative goals as well as dollar volumes, including percentages certified for rapid tax amortization, are indicative of the diesel sales potential in those fields where diesels are a strong economic factor. In the diesel industry itself, certificates of necessity for construction of diesels and internal combustion engines not elsewhere classified show an approved proposed investment of over $40 million, of which rapid tax amortization allowed exceeds 62 per cent. The situation in fields commonly requiring diesel engines will be outlined in following sections.

Transportation

RAILROADS—Compared to the situation a decade or two ago, the railroads are in a relatively favorable financial position largely because of their substantial investment in diesel-electric locomotives, labor-saving devices, adoption of improved operation methods, and the exercise of the most thoroughgoing economies. Technological improvements, resulting in greater operating efficiency, have aided substantially in holding freight rate increases considerably below the increases in practically everything else.

Improvement projects slated for 1952 marked the fifth consecutive year in which railroad improvement outlay has been well above a billion dollars. Capital expenditures for improvement in the seven post-war years will have amounted to more than eight billion dollars, a sum equal to the present funded debt of the railroads. Such improvement policies indicate that the railroad industry does not lack faith in its future.

The railroads are a tremendous standout in the Government's certified expansion program. Proposed investment of line-haul operating railroads, shown by approved certificates of necessity, is $2,629,428,000. Of this proposed investment in furtherance of the defense program, 64.3 per cent, or $1,689,463,000, is allowed for rapid tax amortization.

The expansion goal for railroad diesel-electric locomotives has been set at 15,500 locomotive units. This includes all built since January 1, 1950 and to be built by July 1, 1954. This excludes industrial locomotives for non-railroad use, those procured by defense agencies, and locomotives for export. At the end of 1952, certificates of necessity were issued for more than 7700 locomotive units.

Regarding production, the system of unit control was eliminated effective with the allocation of Fourth Quarter 1952 materials for First Quarter 1953 production. This will further the industry's opportunities to apply the great-

RAILROADING

"Mechanization and labor-saving devices have constituted the railroads' prime post-war approach to the problem of soaring costs. Compared to the situation a year ago, railroads are in a relatively favorable financial condition, in considerable measure because of their large investments in diesel engines.

Against an estimated total of 2,900 diesel locomotive units likely to be produced in 1952, the board visualizes for 1953 a sales potential of 3,350.

Year	Total Units
1953	3,350
1952	2,900
1951	3,200
1950	3,174
1949	2,299

HIGHWAY TRANSPORTATION

"Wear and tear run high in this field, and the upward movement of the country's economy also is a fundamental stimulant for increased equipment demand.

In trucks, the diesel industry made 1952 the second best year in history with final figures for the year likely to show diesel truck sales approximately 14,500 units. The 1953 potential is estimated to be 17,000 diesels for trucks.

Buses did not fare so well, with an expected 2,900 factory sales for 1952 and a potential of 3,400 buses powered with diesels in 1953.

Year	Truck	Bus	Total
1953	17,000	3,400	20,400
1952	14,500	2,900	17,400
1951	8,700	7,550	16,250
1950	8,678	7,361	16,039
1949	8,363	7,089	15,452

MARINE

"The marine field has high sales potentials for 1953. In the Board's view, both naval and private shipbuilding will expand. Recognition is given to the inland waterways program as the government goal for specified types of vessels is 3,923 new vessels of all types, not including vessels exclusively for the Great Lakes.

Thus a substantial rise in marine diesel production and demand is foreseen. A total of 2,475 marine diesels for powering all types of vessels is visualized, compared to an estimated final total for 1952 of 2,080.

Year	Vessels Over 100 Gross Tons	Diesel Engines for smaller vessels
1953	131	2,344
1952	114	1,966
1951	81	2,162
1950	77	1,869
1949	89	1,467

est possible ingenuity in stretching allocations of controlled materials.

TRUCKS AND BUSES—These important factors in transportation are expected to continue their fundamental long term growth. Trucking revenues in 1952 are likely to top even the record-breaking totals for the year 1951, with new highs ahead for 1953. A gain of 3 to 7 per cent in intercity truck tonnage is indicated for 1953 over 1952.

Increasing demand for diesel-powered trucks made 1952 the second best year in the history of such equipment. Continuation of the trend, plus the easing materials situation, should make 1953 a banner year with an estimated 17,000 diesels going into trucks.

Diesel bus production did not fare so well, relatively, as did trucks. Heavy post-war buying to fill out depleted bus fleets and to meet expanding transportation needs caused a temporary reduction in subsequent demands. For 1953, a potential of 3400 diesel-powered buses is visualized.

Added to basic growth in these fields is the factor that substantial numbers of diesel-powered vehicles will soon require replacement through normal wear and tear. Thus, a growing replacement increment will be added to the expansion pattern.

Auguring well for the future of trucks and buses, a tremendous road-building program throughout the country is in the making. Over two billion dollars in state and federal funds have been earmarked for highway construction. An equivalent amount is collected annually by the states. The wherewithal for better and more extensive roads is fast accumulating.

Agriculture

The field of agriculture has been, and continues to be, an outstanding one for diesel engine usage. Mechanization, and that means diesels, is given tremendous stimulus through pressure brought to bear by the Department of Agriculture. Past gains of farming, as represented by a 40 per cent boost in farm production over pre-war level on the same amount of cropland, points up the still brighter future through using more modern farm equipment.

Affecting public health so directly, agriculture obviously merits a stamp of prime essentiality. It is notable that output of diesel-powered tractors for agricultural usage increased in the first half of 1952, over the first half of 1951, despite the difficult materials situation.

Further emphasizing the growth pattern, in the first half of 1952 total diesel-powered tractors, excluding garden type, reached 40,333. This compares with 35,782 in the similar period of 1951. Of these totals (1952), 14,907 were wheel type, exclusive of garden and contracors' off-highway types; 2434 were contractors' off-highway wheel type; and 22,992 were track-laying type tractors.

Not all of the above tractors were taken by agriculture,

MUNICIPAL and UTILITY

"Municipal demand will show a sharp rise in 1953, in the Board's view, over sales for 1952 held down by material shortages. The approved certificates of necessity in utilities and sanitary services aggregate $3,314,265,000, a tremendous challenge to the diesel industry. The Board feels that there will be about 400 installations, compared with an estimated final figure for 1952 of 355 diesel installations for central and municipal power plants in 1952.

Year	Installations
1953	400
1952	355
1951	450
1950	436
1949	307

GENERAL INDUSTRY

"This was the hardest hit classification of diesel markets in 1952 by reason of raw material restrictions; no more than 9,000 diesels were produced for this field in 1952, though production in the late months was rapidly on the rise. The year 1953 is to be entirely different with 12,000 engines slated for applications in general industry.

Year	Engines
1953	12,000
1952	9,000
1951	13,146
1950	12,378
1949	11,131

PETROLEUM

"This is another field of potential expansion of diesel sales. International tension makes necessary further development of petroleum sources and refining here and in Canada. Approved certificates of necessity for petroleum and natural gas extraction and refining total $1,408,628,000. Compared to 3,525 as the estimated final 1952 figure, 1953 should show 3,800 diesel engines being put on the line in the petroleum industry.

Year	Engines
1953	3,850
1952	3,525
1951	3,600
1950	3,546
1949	3,197

MINING

"The great demand for raw materials reflects a rising demand for diesels in this field. Proposed mining investments are $721,631,000, and a favorable trend for diesels is much in evidence. With an improved materials situation indicated for 1953, there exists a new high potential of 2,475 diesels in 1953. This total compares to the Board's final figure of 1,950 engines in 1952.

Year	Engines
1953	2,475
1952	1,950
1951	2,325
1950	2,317
1949	1,986

of course. Also, these figures do not include small diesel-powered plants for farm use or the garden type tractors used on many small farms. The Board's final estimates of the number of diesels that went into farm use in the year 1952 are computed at 63,285 units. They see a potential of 69,000 units ahead for 1953.

Mining

Mining represents a field with a rapidly rising potential for diesel engines, reflecting the great demand for raw materials and fuel. Proposed expansion in this field is best indicated by tabulating some of the proposed investments and the percentages approved for rapid tool amortization.

Mineral	Proposed Investment	Rapid Amortization	Percentage
Iron Ores	$721,031,000	$505,752,000	70.1
Copper Ores	$116,134,000	$ 68,705,000	59.2
Aluminum Ores	$103,377,000	$ 82,411,000	79.7
Soft Coal	$ 56,000,000	$ 32,755,000	58.5

These represent approved certificates of necessity and there are numerous others in the general mining field. As diesels are used in practically all forms of mining, either directly or for transportation, a favorable sales potential exceeding that for 1952 is seen as existing.

Municipal Power

Municipal demands for diesel engines will show a sharp rise in 1953, in the Board's view, over the sales of 1952. Rising population, increasing electrical consumption per capita, and the trend—particularly in rural areas—to use electricity in place of manpower, all add to the demand. Farms today are little industrial plants differing from the formal conception of the term only in the product produced. Add to all this the increasing power demands of small industries scattered throughout the communities, and the growth pattern is clear.

Approved certificates of necessity show that the second highest total in proposed investment is for utilities and sanitary services—aggregating $3,314,265,000 of which $1,425,912,000, or 43 per cent, is allowed for rapid tax amortization. That tremendous aggregate really represents a challenge to the diesel industry to get its share of this spending. Primary power sources; peaking, end-of-line, and standby service; pumping of all types; and power for sewage disposal plants are some of the more obvious applications.

General Industry

The effect of material shortages was most felt in this classification. Approximately 9000 engines were produced for this field in 1952, but significantly, production was on the rise at the end of the year. On the basis of this trend and proposed investment expansion in fields where diesels have been used to good advantage, it is felt that with good promotion and sales effort the potential sales volume for 1953 is at least 12,000 units.

In many important general industrial fields, expansion goes on apace: textile mill products have a proposed capital investment approved totaling $63,000,000; food and

(*Continued on page 73*)

CONSTRUCTION

"Tremendous wear and tear on construction equipment with replacement potentials rising rapidly makes the construction industry extremely important. Possibilities for highways alone are considered enormous. With increasing congestion and depreciation of old roads, coupled with success of new toll roads, the total outlay for new and maintenance work is expected to reach $2,700,000,000 in 1953 compared to $2,450,000,000 for 1952. All told, the construction industry will require 28,700 new diesels in 1953, compared to a final figure of about 23,500 for 1952.

Year	Engines
1953	28,700
1952	23,500
1951	28,583
1950	27,468
1949	26,342

AGRICULTURE

"Auguring well for 1953 diesel sales, agricultural objectives will stimulate their further use. Obviously meriting a stamp of prime essentiality, diesel-powered tractors for agricultural use increased in the first half of 1952 over the first half of 1951 despite the difficult materials situation.

The use of diesels in agriculture as tabulated by the Board indicates a final 1952 figure of 63,285. For 1953, a sales potential of 69,000 diesels for agricultural use is visualized.

Year	Engines
1953	69,000
1952	63,285
1951	70,000
1950	70,053
1949	66,825

FIVE YEAR TOTALS

	1953 Projected	1952 Revised	1951	1950	1949
Railroading	3,350	2,900	3,200	3,174	2,755
Highway Transportation	20,400	17,400	16,250	16,039	15,452
Marine	2,475	2,080	2,243	1,946	1,556
Municipal	400	355	450	436	307
General Industry	12,000	9,000	13,146	12,378	11,131
Petroleum	3,850	3,525	3,600	3,546	3,197
Mining	2,475	1,950	2,325	2,317	1,986
Construction	28,700	23,500	28,583	27,468	26,342
Agriculture	69,000	63,285	70,000	70,063	66,825
	142,650	123,995	139,797	137,367	129,551

Now About Antifreezes . . .

Worthwhile pointers to guide you in the selection and use of antifreezes.

Q—Look, the peddlers have been after me to buy anti-freezes for my truck fleet and at this point, I am so confused with high-sounding names that I don't know what's what. How about it?

A—It's really not hard; there are only two general types that are widely recommended. They are classified as "high" or "low" boiling point types. Most commonly, the first type, frequently called "permanent" type, is inhibited ethylene glycol. The second class is, generally inhibited methanol (methyl alcohol) or ethanol (ethyl alcohol.)

Q—Yeah, but they threw a lot more names at me.

A—Well, mixtures of methanol and isopropanol (isopropyl alcohol) and mixtures of glycols, such as ethylene glycol, diethylene glycol or propylene glycol, as well as straight propylene glycol have had more limited use. Then there are a lot of other things that have been used but they don't fill the bill with today's engines.

Q—What are some of these, so that I can shy off?

A—Oh, there are a lot of things. We've pretty well gotten away from the kerosene and molasses days so the general classes to stay away from are the inorganic salt-base antifreezes (calcium and magnesium chlorides) and the petroleum "antifreeze" coolants.

The big trouble with the first type is that it is just about impossible to inhibit them properly so as to offset their natural corrosive tendencies. The second type raises the devil with some types of rubber hoses, is a potential fire hazard, and is inferior to water as a heat transfer agent. Then, they run the boiling point so high that you get no warning of overheating until the engine and/or the radiator is a wreck. Incidentally, many states have laws to prevent the distribution and sale of these products.

Q—OK, we're back to two types, ethylene glycol and alcohol-base antifreezes. Are all of these good?

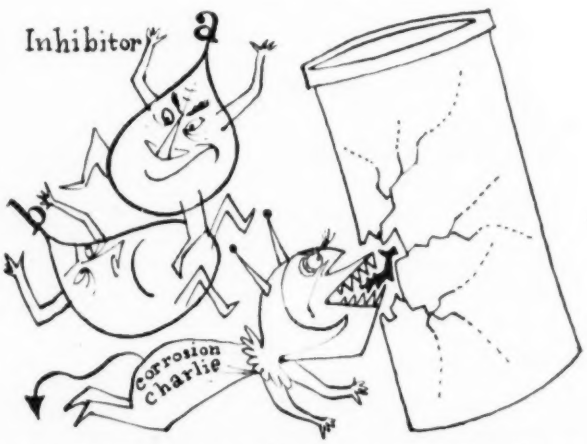
A—No, not necessarily. Unless you are in a position to do some checking or get expert advice, I'd stay with good "brand" names.

Q—I've used both types, but which is best?

A—Oh no, you can't pin me down on that. It is a matter for local decision; you must take into account the type of operation, climatic conditions and altitudes, for example. I'll say one thing, you can get poor results with either type unless you install and service it properly.

Q—Wow! Another headache! You mean. I just can't pour it in and forget it?

A—Oh, brother! That's the trouble with you fellows. It's an engine system, isn't it? You check your fuel system and lube oil, don't you? Well, pay some attention to



If the inhibitors in mixed antifreezes are not compatible they may "react", letting corrosion go to work.

Based on information in the Report of Committee D-15 on Engine Antifreezes, American Society for Testing Materials, and National Bureau of Standards Circular 506.

your water cooling system; it's equally important. Not hard, either.

Q—So, what's the pitch?

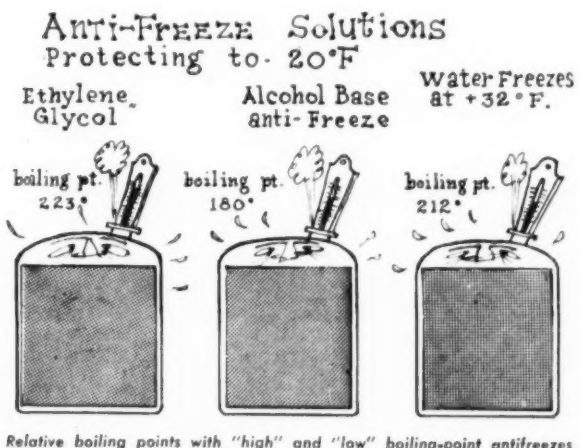
A—First of all, I hope that you have been using some sort of corrosion inhibitor with the water, during the summer months, and that the water was not too hard. Otherwise, you might be in a bad way about rusting, pitting, and scale. In this case—and you should do it periodically anyway—you should give it the full treatment. If the cooling system is rusty or the radiator dirty inside, it needs chemical cleaning. Good commercial cleaners are available of either the inhibited acid or alkaline type.

Even if the system is good and clean, g ve it a thorough water flush anyhow. If you used a soluble oil inhibitor last summer, be sure to drain it completely and flush with water before you put in the anti-freeze. Soluble oils do not always get along very well with antifreeze. When you have the system good and clean —oh, yes and tight—put in the proper amount of antifreeze and fill with water.

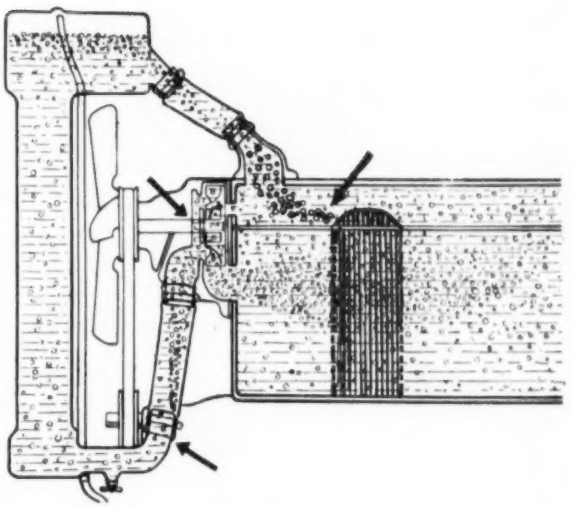
Q—I've seen inhibitors used, and still there has been corrosion. Got any quick answers?

A—Oh, sure. One of the commonest beliefs is that inhibitors are supposed to work after the trouble has started. Some fellows will suddenly wake up late to the importance of inhibitors, dump them into a corroded, rusted system, and expect them to clear things up. Starting with a clean system and then continuity of inhibitor application, is the only answer to rust prevention.

Continuity with the *same* inhibitor is important too. Mixing of inhibited antifreezes can be dangerous. The inhibitors may not get along together and will react to reduce corrosion protection, cause deposits, or promote foaming. Leaks "in" to the system, as well as "out" of it, can cause trouble.



Relative boiling points with "high" and "low" boiling-point antifreezes mixed to give the same protection compared with plain water (inhibited of course).



Gas leakage "in" to a cooling system takes two major forms: Air intake ahead of pump suction from loose hoses, leaky water pump, etc.; and gas leaks from faulty combustion chamber sealing.

Q—Leaks "in" and "out" of the system cause trouble? What's this leaking "in" business?

A—Taking the "out" first, it can be expensive continually losing antifreeze and dangerous to run low on solution. Out on the road, you may fill up with bad water or have to use an antifreeze with an incompatible inhibitor. This can lead to trouble. Perhaps more important is the effect when the water in the radiator gets below the top of the tubes. A great deal of air then in pulled in as the water circulates, and oxygen promotes corrosion.

This is the clue to the "in" business. Loose hose connections, radiator leaks, and water pump leaks on the inlet side of the pump permit air to be sucked in. Gasket leaks from the combustion chamber allow harmful combustion gases to blow into the cooling system. The inhibitor may not last long if required to provide protection against these conditions. Don't forget, the cooling liquid can leak the other way too.

Q—I've heard that the ethylene glycol can get through some mighty small holes. Is that right?

A—That's a popular misconception. Tests have shown that properly inhibited ethylene glycol solution is no worse than water, in fact, better in this respect. It's up to the designer to build an engine with a water system that can be kept tight, and the maintainer to keep it that way. Leakage of water or antifreeze into the engine can cause serious damage. Glycol solution is not as easily removed from the crankcase as is alcohol because of higher boiling point. The results "ain't good" with any kind of "in" leakage.

Q—Now, about these boiling points. . .

A—I've got a little sketch that shows this pretty well. Take a look. With the ethylene glycol-base antifreezes,

you don't have to worry under normal operating temperatures. With the alcohol-base antifreezes, you may have to watch for boil-off. Notice, that the boiling point is 180°F with protection down to —20°F.

Why protect that low unless you really need it? All that you are doing is lowering the boiling point of the mixture as you add alcohol and it will boil off that much faster. Protect only to the temperatures that you have reason to expect. This will keep the boiling point as high as possible. The engine operating temperature should be below the boiling point of the antifreeze solution. You'll have to watch out for exceptionally cold days.

Q—If I buy a hydrometer, I'll be able to check the solution, won't I?

A—Yes and no. If you have the correct one for the antifreeze that you are using, you'll be alright. If you have a mixture of antifreezes, or a hydrometer for the wrong base antifreeze, you can be way off base. Hydrometers measure the specific gravity of the mixture and this varies with the percentage of antifreeze to water. It will also vary with the specific gravity of the antifreeze used, and also the temperature.

The scales are calibrated to read directly the freezing point of different concentrations (as a function of specific gravity) of a given type antifreeze at a standard temperature. So you have to know what antifreeze you have (another good reason for not mixing them), the hydrometer must have the proper scale and should have a thermometer and a temperature correction chart.

Q—What about using the hydrometer; I suppose there is an angle here?

A—Well, there is a right and wrong way to do everything. Keep the barrel clean so that you can read the scale on the float. Fill and empty the barrel several times to warm it up. Of course, the solution should be thoroughly mixed and up to normal operating temperatures. Just check that the float is not resting at the bottom of the barrel or hitting the top or sides. When you get the right float reading, you can make the necessary corrections for temperature and then get the correct freezing point off the *right* scale.

Q—Why don't I just put in plenty of permanent-type anti-freeze and let it go at that? I can always re-use it.

A—Use the ethylene glycol type if you want a higher boiling point. It won't boil off and as long as the system is tight, there should be no make-up. To over-protect though, you are just throwing money away to save a little effort. A broken hose or a water pump gone sour will lose you just that much more money.

Don't re-use any kind of antifreeze. That's another popular misconception. Thanks to the varying conditions of operation and maintenance, not even laboratory tests can tell you the service life of the corrosion inhibitors. You may not have any more rust protection than you need for one season of high mileage driving, or in heavy service. To be safe, throw it away; it can be cheaper in the long run. Charge it up to insurance. Rusty coolant is your red flag any time of the year.

Q—Let's get a run-down, then.

A—OK. Start with a clean tight system. Pick the antifreeze that you are going to use. Be sure that it will be available later so that you won't have to mix antifreeze if make-up is needed. Be practical in selecting the degree of protection. Fill the system with the antifreeze and clean soft water. Then check it periodically with a good hydrometer.

When you no longer need antifreeze protection, drain and flush the system. Chemically clean if necessary. Refill again with clean soft water and put in a dose of inhibitor to again protect the system from rusting and corrosion during warm weather. A little care expended in this manner will save a lot of the green stuff as well as improve performance.

What Do You Know!

More questions to test your knowledge of the diesel field. Mark your selections and turn to Page 105 where the correct answers appear.

1. Which of the following is the greatest single contributor to faulty operation of centrifuges?
   a. Rough handling
   b. Excessive speeds
   c. Improper cleaning
   d. Inadequate lubrication

2. Kraft paper liners can be used to facilitate centrifuge bowl cleaning operations.
   a. True
   b. False

3. Four general types of antifreezes are listed. Which two are not recommended for use in today's engines?
   a. Inorganic slat-base
   b. Alcohol base
   c. Ethylene glycols
   d. Petroleum base

4. Presence of gases containing oxygen in the cooling water has the major effect of promoting which of the following?
   a. Scaling
   b. Foaming
   c. Corrosion
   d. Sedimentation

5. A feature of "permanent" type antifreezes is that they can be reused from year to year.
   a. True
   b. False

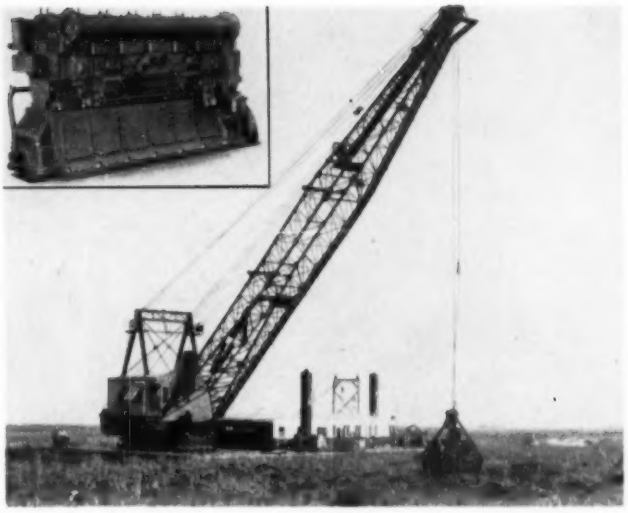
6. The estimated number of diesel engines of all types to be manufactured in 1953 is about:
   a. 122,000
   b. 132,000
   c. 142,000
   d. 152,000

7. Which of the following types of failure are not common to traction motor roller bearings?
   a. Fatigue failure
   b. Denting
   c. Electrical pitting
   d. Smearing

8. Normally, traction motor bearing loads are applied in a direction dictated by contact angle of pinion and gear teeth.
   a. True
   b. False

Diesel Power in the Delta Country

Target — 99 per cent pure sulfur, but first a silt levee must be constructed to hold fresh water for mining operations — a man-size job.



IN endless swampland that is the Mississippi Delta, man's genius is waging a herculean struggle against nature. The contest, witnessed by only a few participants, is unheralded in the world outside. Yet its prize is of major importance to this country's industrial welfare. The treasure, a new reserve of 99 per cent pure sulfur, lies deep beneath the waters of the Mississippi Delta, a challenger of great reward to the ingenuity of American engineering.

Discovered by wildcat drillers in the marsh, 100 mi outside of New Orleans, a vast new sulfur deposit is the target of Freeport Sulphur Company's $15 million mining project. Sulfur mining requires huge quantities of fresh water and it would seem that such need in the vicinity of an abundance of water would be contradictory. Unfortunately, water from above the deposits is fouled by brine backing in from the Gulf. Thus once again to man's resourcefulness has fallen the task of isolating virtual islands or reservoirs of fresh water within these tidelands to heat and pump underground for mining these rich, new mineral deposits.

When completed in 1953, Freeport's production of vitally needed sulfur is expected to add 1½ million tons a year to this country's hard-pressed supply of this urgently needed element. The development is considered the largest project of its kind to be put into operation in the last 40 years anywhere on the globe.

Building a levee or dam to isolate a fresh water reservoir in the delta region, calls for moving 2.8 million cu yd of silt. Undertaken by the J. Ray McDermott & Co., Inc., long time specialists at this type of work, the work is now underway and is expected to be completed in the next nine months. When finished, the levee will be 100-ft wide at the base, 10-ft wide at the crown, 12-ft high, and 6-mi long.

The reservoir formed by the perimeter of the levee is designed to store 1 billion, 200 million gal of fresh water. This water will be drawn from the Mississippi River during periods of the year when the salt content is at a minimum. However, due to losses resulting from evaporation, seepage, etc., it is contemplated that the reservoir will maintain a capacity of 600 million gal. The need for such a supply is evident when it is known that over 2 million gal of superheated water are required each day in melting underground sulfur deposits for pumping to the surface. High salt content of sea water obviously would cause scale deposits in boilers and other equipment.

Diesels Work Around the Clock

Excavating is being done with a Bucyrus-Erie walker dragline mounted on a barge. Swinging on 140-ft boom, for maximum reach, is a 6-cu yd clamshell bucket. The clamshell moves 10 to 12 thousand cu yd of silt a day on a round-the-clock basis. In construction of the levee, silt from the bottom must of necessity be laid down easily onto the levee or it spreads too much to be effective in building up a wall. As a result, the bucket must be brought around and stopped before dumping each load of silt. In spite of this extreme operational requirement, the excavator performs on a 30-sec cycle, considered unusual for this type of equipment. Powering the shovel on this continuous, 24-hr, 7-day week, schedule is a Cooper-Bessemer Type GS 400-hp diesel engine with Ward Leonard controls.

The half-million dollar spud barge on which the dragline is mounted is the "A. H. Stall", owned and operated by J. Ray McDermott & Co., Inc., of Harvey, Louisiana. Although this piece of equipment is designed for use in inland water, it can be taken through rough seas to any part of the world. When fully loaded with fuel, water, and supplies, the barge draws 5 ft of water. In its hold are 10,000 gal of drinking water, 76,000 gal of fresh water, and 56,000 gal of diesel fuel. Storage capacity enables 4 mo continuous operation without adding fuel or water.

Completely equipped to house a complement of 18 men, the living quarters of the "A. H. Stall" are air-conditioned for maximum comfort in the hot delta region. Three crews keep excavating operations underway 24 hr a day. Two 12-hr crews work during the day, and at night under floodlights. The third crew is on liberty for three days.

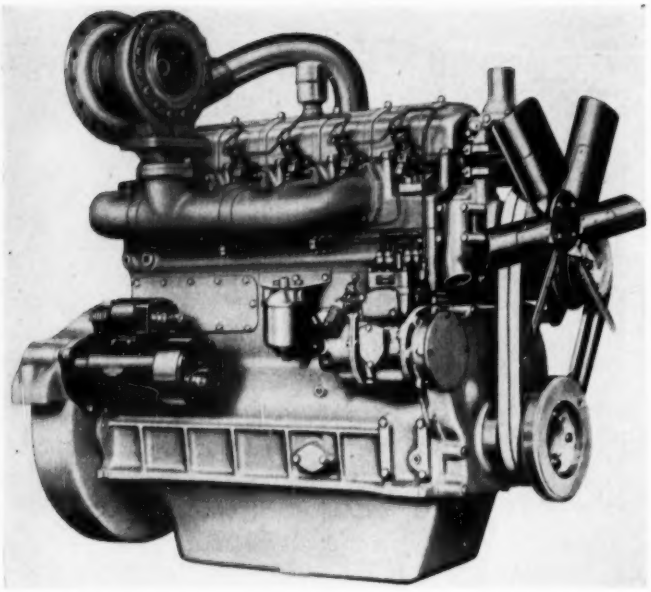


Fig. 1 illustrates the supercharged model 135-DKBS engine developing 185 hp at 2800 rpm

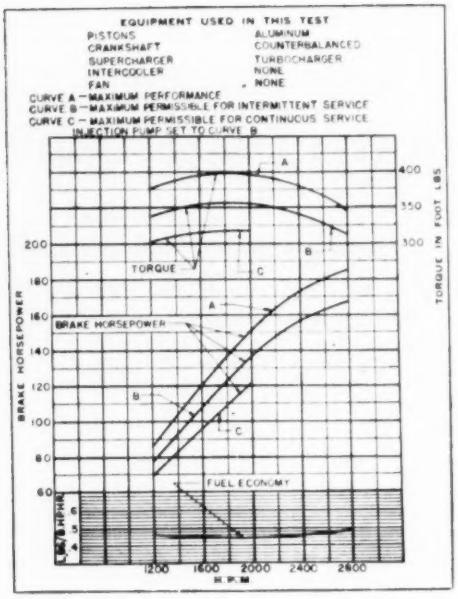


Fig. 2 Above are the performance curves for the 426 cu in engine at left.

Waukesha Turbocharges

Five engine sizes — 426, 779, 1197, 1905, and 2894 cu. in. displacement — are currently being produced as turbocharged units. Incorporation of turbochargers has produced substantial power inceases and greater fuel economy.

Waukesha has extended the advantages of turbocharging to relatively small engines. They have been among the first to exploit the fairly recent availability of commercially-produced turbochargers of small size. They are certainly the first of the engine builders to offer a turbocharged engine having only 426 cu in displacement.

Turbochargers have been applied to five basic diesel engine sizes, three for transportation or industrial service and the two largest as complete power units for industrial service. The 1197 cu in model is supplied either as a bare engine or complete unit. Extension of turbocharging into this light-weight, high-speed engine field is in the nature of a milestone and could well have lasting and far-reaching effects. Application to transport engines is particularly noteworthy.

It was only a few years ago that papers were presented at Technical Society meetings, tending to prove that turbochargers could not produce suitable torque curves or provide adequate acceleration to meet the requirements of this service. While this was probably true at the time, it speaks well for the engineering that has gone into recent turbocharger design and in adapting these new models to production engines that, today, such units are available.

The specific models now being produced are listed below, showing stripped engine maximum power.

Model	Cyl.	Bore and Stroke	Displ.	Hp @ RPM
135 DKBS	6	4¼ x 5	426	185 @ 2800
148 DKBS	6	5¼ x 6	779	280 @ 2100
WAKDS	6	6¼ x 6½	1197	352 @ 1800
NKDS	6	7 x 8¼	1905	380 @ 1200
LRDS	6	8½ x 8½	2894	570 @ 1200

The turbocharged ratings represent power gains from 147, 200, 225, 298, and 406 hp respectively. All of the engines are heavy-duty, six-cylinder, four stroke cycle units.

Waukesha Combustion System

All engines incorporate the Waukesha spherical combustion chamber. Design of the spherical cavity and the tangential throat opening into the main combustion chamber promotes controlled turbulence and aids in obtaining clean, complete combustion.

An insulating air space surrounds the lower half of the cup and the retained heat is given up to the air during compression. This reduces ignition lag and since the amount of heat retained will vary with the load, this feature has the effect of advancing or retarding the time of combustion. The upper half of the cup, including the injector mounting bore, is water jacketed.

American Bosch injection equipment is used although, as might be expected, the sizes and types vary. The smallest engine uses the single-plunger, flange-mounted, distributor-type Bosch PSB pump. The others use the multiplunger, APE type unit in sizes suitable for the engine displacement. All models use single-orifice, pintle-type injectors.

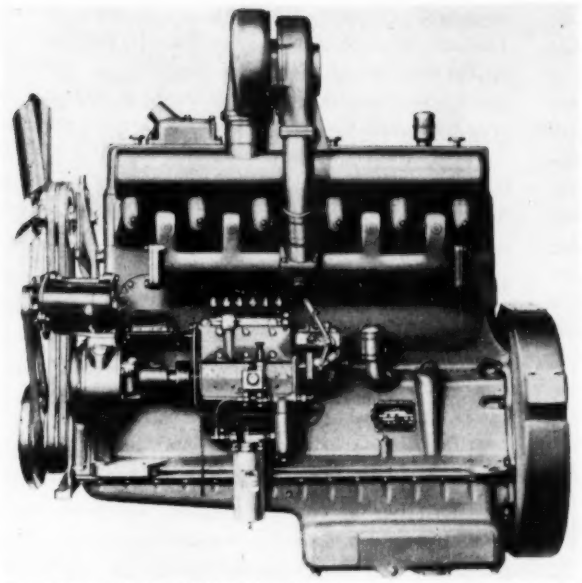


Fig. 3 Output of the 6-WAKDS has been boosted from 225 hp to 352 hp by turbocharging.

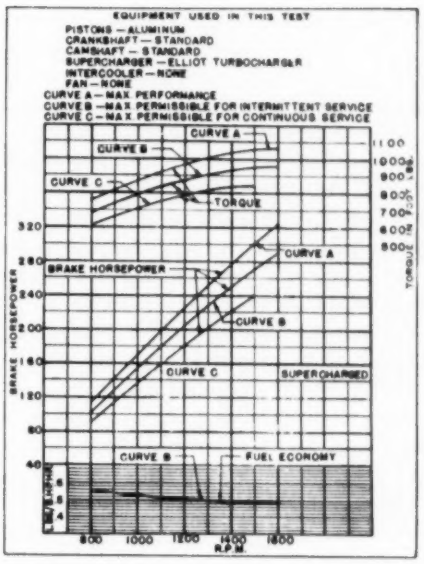


Fig. 4 Performance curves illustrated here are for the turbocharged 6-WAKDS at left

Variable speed, centrifugal-type governors are incorporated with the injection pumps on the three smaller units. These are fully enclosed, self-lubricated units with good non-hunting characteristics. The governors on the larger LRDS and NKDS engines are also of the centrifugal type and are gear driven. Their functions are combined with hand-throttle control.

Model 135-DKBS

The major component of this (426 cu in) smallest of the turbocharged engines is a Waukesha iron crankcase-cylinder casting. Alloy liners of the dry-sleeve, replaceable type are fitted in the bores. Sturdy main bearing bridges and caps support a heavy drop-forged, heat-treated crankshaft that has been counterbalanced for high speed operation. Hardened journals turn in precision-type bearings.

Connecting rods are also heat-treated, drop-forgings. They are rifle-drilled to provide lubrication to the full-floating piston pins. Pistons are designed for heavy duty and are of alloy aluminum. Of the three wedge-type compression rings, the top one is chrome plated. Two straight-side oil control rings are used.

A block-mounted camshaft actuates hardened and ground barrel-type lifters which through pushrods move the drop-forged rocker arms on the cylinder head. The valves are Stellite faced and seat on Stellite-faced inserts. The cylinder head also mounts the manifolds. The Schwitzer-Cummins

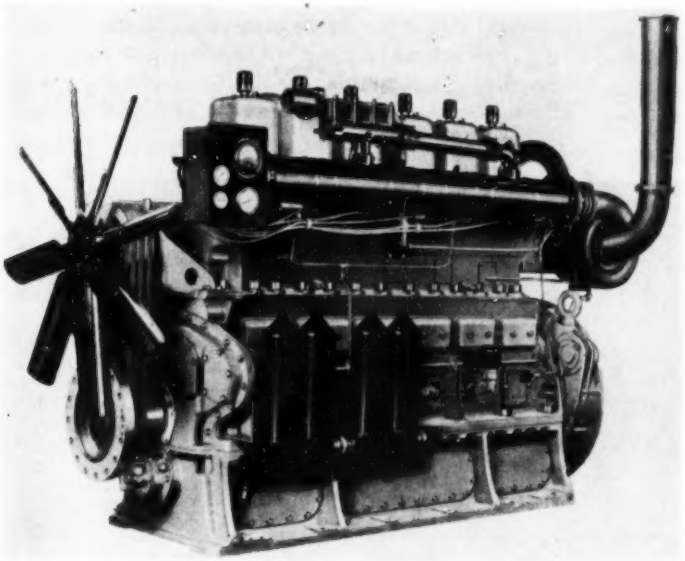


Fig. 5 The 6-cyl model LRDS has a total displacement of 2894 and develops 570 hp at 1200 rpm

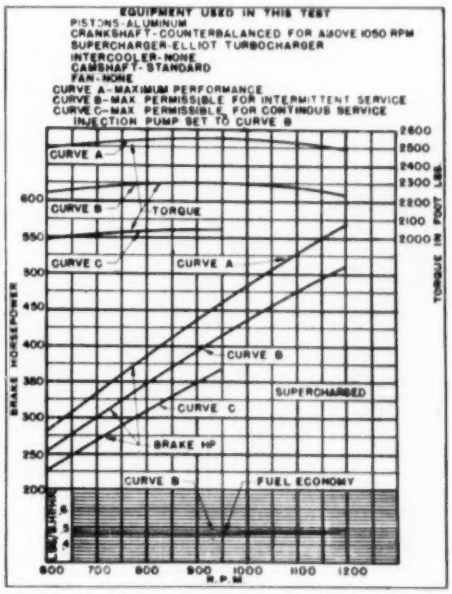


Fig. 6 Performance curves for the 6-LRDS.

turbocharger is mounted directly on the exhaust manifold with the blower piped to the intake manifold for downdraft intake.

Lube oil circulation starts at a floating intake screen in the pressed-steel oil pan. The gear-driven, gear-type pump then circulates it under pressure to the main, connecting rod, camshaft and piston pin bearings. Timing gears and rocker arms receive metered intermittant pressure flow. Crankshaft throw-off is depended on for cylinder lubrication. Spill-back from the valve chamber floods the cams and tappets.

Oil filtration is of the shunt type. A large dual-element waste-packed filter bolts directly to the crankcase.

The cooling water circulating pump is flange-mounted on the front of the cylinder block. A bypass and space for a thermostat is provided. Provision is made for V-belt drive, not only for the water pump but for radiator fan, generator, etc., as called for in the installation.

An SAE No. 3 bell housing of the arm-type houses the flywheel. This, along with a front trunnion, is used for engine support. Other equipment available if the installation warrants include oil bath-type air cleaner; fan for mounting on the coolant pump hub; complete 12-volt electrical starting system including flywheel ring gear; instruments, accessories and controls for special services.

Model 148-DKBS

This 779 cu in engine is designed for heavy-duty long-haul transport use, and special industrial services. It has all the features common to Waukesha diesels of this size and larger, including wet cylinder sleeves, precision bearings, overhead valves, water pump cooling, pressure oiling, and oil cooled aluminum alloy pistons. The hardened, seven-bearing crankshaft is counterbalanced, with a torsional vibration damper; non-sticking wedge-type compression rings, with the top ring chrome-plated; Stellite inserts for intake and exhaust seats and Stellite-faced valves; renewable valve guides, dual valve springs, high capacity oil pump, built-in oil cooler, and exclusive clean-burning combustion chamber. The turbocharger is mounted on the top of the exhaust manifold and rigidly supported by brackets to the cylinder head. The air charge is piped to the downdraft intake manifold on the left side of the engine. In common with all Waukesha turbocharged diesels, this engine is exceptionally rugged, and built for heavy-duty, rough-and-tumble service.

The 148 DKBS uses either a 24-v electric starting system or the Waukesha Model ICK 4-cylinder, 61 cu in starting engine, as do the larger Models 6-WAKDS and the 6-NKDS.

Model 6-WAKDS

This 1197 cu in model is furnished as an engine for transportation or industrial use, or as a complete power unit with sheet steel housing, radiator and other unit accessories. The complete unit is designated as Model 6-WAKDSU.

The principal difference in the transportation and industrial versions of this engine is the crankshaft. For transportation use, higher sustained operating speeds are generally needed, and the crankshaft is counterbalanced. Removable wet-type cylinder sleeves and other internal features are similar to those listed in detail in the preceding description of the Model 148DKS engine.

An external gear pump supplies pressurized oil to all the bearings, piston crowns, rocker arms, idler gear stud, and the gears. The valve gear and cylinders are drenched by an oil mist. An oil cooler of large capacity is mounted on the cylinder block and is provided with a bypass. Full-flow filtration is provided by a twin-unit, replaceable cartridge-type series filter.

The engine is fitted with a gear-driven high capacity centrifugal water circulating pump. Water is directed to vital head areas which it scours at sufficient velocity to prevent scale deposits and insure long, trouble-free operation. The industrial model, WADKSU, has a radiator and 8-blade, 38-in fan as standard equipment. Multiple thermostats speed engine warm-up and maintain operating temperatures.

Model 6-WAKDS intake and exhaust manifolds are on the same side of the engine. Either plain or water-cooled manifolds are available, and on the bare engine version, the turbocharger is mounted on top of the exhaust mani-

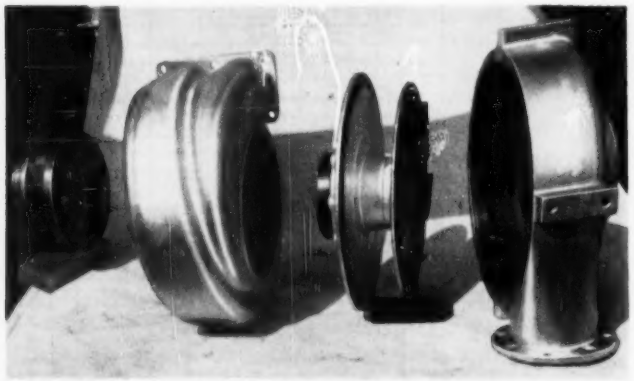


Fig. 7 Left to right are: nozzle ring, inlet casing, intermediate casing, and diffuser and blower casing of the Elliott M-5 turbocharger.

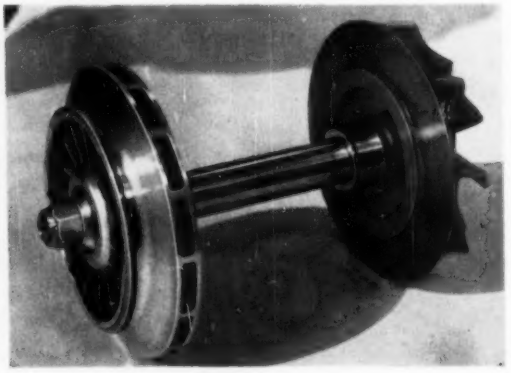


Fig. 8 The rotor assembly with compressor end at left and expander wheel at right.

fold with a supporting element to the cylinder head. It is mounted at the flywheel end of the water-cooled exhaust manifold in the housed power unit version.

Compression rings are the wedge type used on all Waukesha diesels. There are three wedge-type compression rings (top, chrome-plated), one wedge-type compression-scraper ring, and two straight side oil control rings.

Mounting of the transport engine is by means of a front trunnion and an SAE No. 0, either foot or hanger-type, flywheel housing at the rear. The industrial model has the same size flywheel housing and a welded steel front support.

Either a 24-volt electric starting system or Waukesha's ICK 4-cyl engine started with manual pinion shift and starting clutch can be supplied. Also, there are a great variety of instruments, controls including automatic ones, and accessories available.

Model 6-NKDS

Model 6-NKDS (1905 cu in) combines many of the features of the smaller Waukesha diesels with other characteristics of the larger stationary Model 6-LRD. It has an extremely rigid one-piece crankcase-cylinder block, as do the smaller engines, but it is supported on a heavy box base. Large clean-out plates provide access to the interior. Twin cylinder heads, each mounting the upper valve mechanism for three cylinders, are similar in design to the smaller Models 6-WAKDS and 148DKS. In manifold and turbocharger design mounting, however, this model is similar to the larger 6-LRDS. The turbocharger is rear-mounted on the exhaust manifold. A pipe carries the pressurized air to the intake manifold on the other side of the engine.

All the special features that contribute to the long-life and reliability of all Waukesha diesels, and enumerated in the descriptions of various other models, are contained in this Model 6-NKDS. As is true of the larger 6-LRDS, it is generally sold as a complete power unit, with fan, radiator, mechanical starting engine, and power take-off of the clutch or torque converter type.

Model 6-LRDS

Although this engine follows the general design pattern of the Waukesha diesels, some constructional differences are to be expected in view of the increased engine size (2894 cu in). For example, the crankcase and cylinder block are separate castings. The rigid, heavy-sectioned crankcase has generous inspection plates providing access to the bearings and the crankshaft. The latter, designed for maximum stiffness, has hardened journals (400-500 Brin) totaling over 30 in in length.

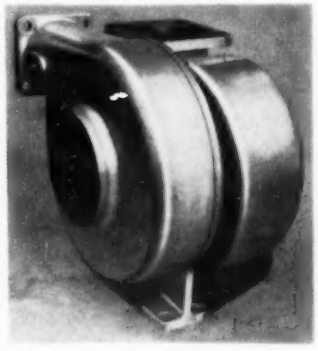
The cylinder block has heavy top and bottom decks. Ribs and baffles direct the flow of coolant around the special alloy, wet-type liners. Inspection openings are provided for scale removal (as for the smaller models, too).

Connecting rods are heavy forgings with 4-bolt caps held in place by heat-treated alloy steel bolts. The pin bushings are of the bronze steel-backed type, diamond bored for accuracy of pin fits. Precision-type bearings are used throughout.

Cylinder heads, one for each cylinder, are interchangeable. Stellite-faced valves and inserts are used, with the valves riding in replaceable guides. Dual valve springs are used. The lifters are of the roller rather than the barrel type and these operate in replaceable guides.

High capacity is provided by the external gear-type lube oil pump. A flexible pressure line carries the lubricating oil to an external header from which cross drillings supply the main bearings. Pressure oil to the rod and pin bearings is supplied through the drilled crankshaft and connecting rods. Metering jets at the top of the rods supply cooling oil to the chambers in the piston crowns. An outside-mounted oil cooler is located between the radiator outlet and water pump intake. Lubricating oil filters are the full-flow type, using throw-away replaceable elements.

(*Continued on page* 101)



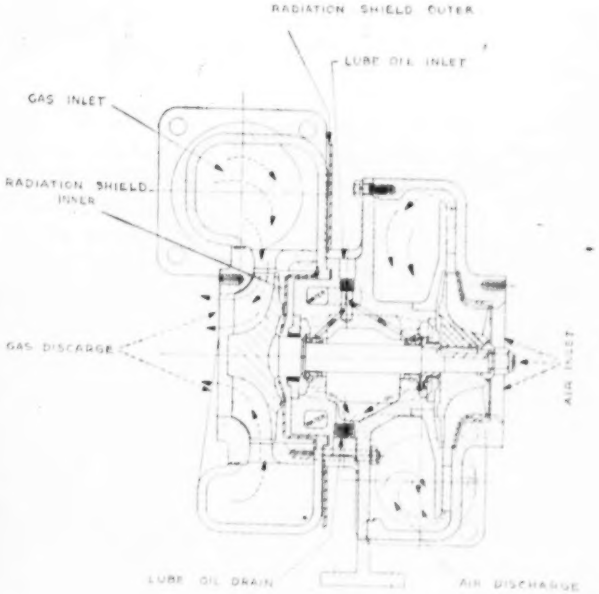
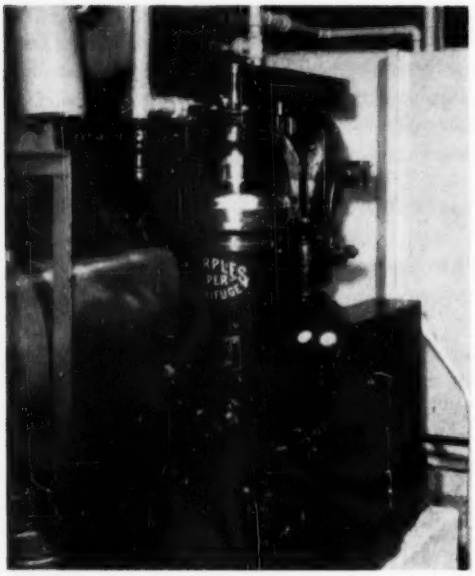


Fig. 9 Assembled M-5 turbocharger at right with cross section of unit at far right.



Cleaning Sharples Centrifuge Bowls

Bowl cleaning leads in frequency all other items of centrifuge maintenance. Proper techniques and short cuts are therefore important.

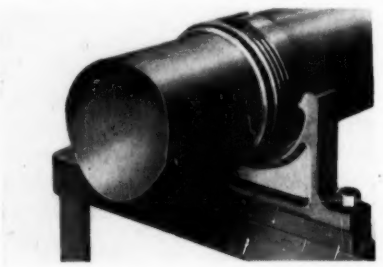
WITH the rotating part of a centrifuge being well balanced for smooth operation, care must be taken to preserve this balance. Normally any solids which are deposited during the process of separation will be evenly distributed in the bowl and will not disturb the balance.

Therefore, when the unit is cleaned it must be done carefully and thoroughly as any deposit which is not removed may cause an unbalanced condition in the machine. This in turn will create excessive vibration and wearing of parts. It will be noted that improper cleaning is the greatest single contributor to faulty operation.

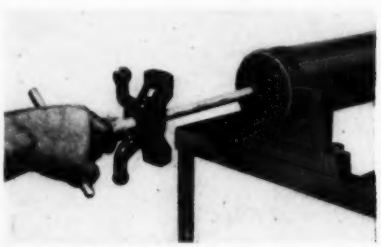
Before going into the actual cleaning process, it might be well to point out the different techniques. Perhaps the fastest way of getting a loaded centrifuge back in operation is to have an additional bowl on hand which could be interchanged with the one to be cleaned. However, in most applications there is ample time for cleaning, which is done normally with tools designed for this work.

Another method for cleaning is one which employs a parchment or Kraft paper liner. With this system, solids may be removed from the bowl easily as they impinge on the paper and not the bowl wall. When using a liner in the bowl, the three-wing assembly edges must be filed in order to allow space for the paper. It is also necessary to have a bowl extension sleeve.

By following these steps carefully, having adequate facilities and the proper tools, time required for bowl cleaning can be shortened.

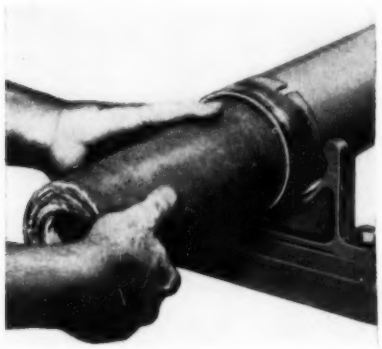


1. For all practical purposes we will start with a clean bowl resting on its vice. At this point if a paper liner is to be used, it is loosely rolled and slipped into the bowl. A look at the illustration will tell you that a sturdy bench erected near the unit with a cabinet for tools and spare parts will come in handy.



2. This step remains the same regardless of whether or not a liner is used—the three-wing assembly is inserted into the bowl and seated against the bowl top. The three-wing puller can be used for this job as illustrated. With this done, the bowl bottom is screwed in place, tightened with a special spanner wrench, and the bowl put into service.

3. When the bowl is taken out of service for its next cleaning, it is put in the vice and the bottom is removed. Now, the next step depends on whether or not a liner has been used. If none, the three-wing puller is used to remove this assembly. However, if a liner has been used, the bowl extension sleeve is screwed in place and a wooden block placed on the floor. The bowl is then lifted about 18 in above the block and allowed to drop of its own weight. Depending on the contents, this operation may have to be repeated several times. It will be noted that if the bowl is soaked in solvent for a short period just prior to this operation, the contents may be removed more readily.



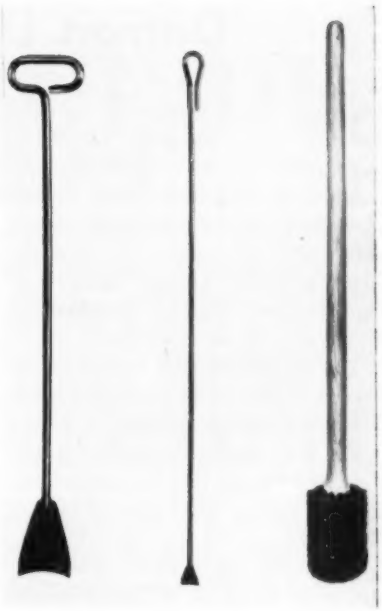
4. After the liner and solids have slipped down into the bowl extension sleeve a sufficient amount, place the bowl in the vice and remove the cylinder of solids and the three-wing assembly.

5. When the three-wing assembly is removed, it may be cleaned easily with a spatula.

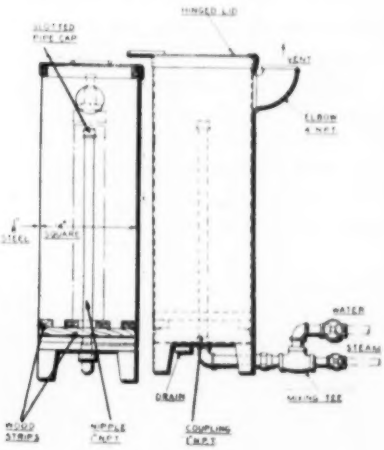
6. Scraping is not often necessary when a liner is used. However, in cases where no liner is used the solids must be removed from the bowl with the cleaning rods. In some instances a long flexible spatula is used for this operation, depending on the type of residue encountered.

Care should be exercised when using the cleaning rods as excessive scraping of the rod on the lower end of the bowl may injure the lip against which the gasket seals.

7. Next the bowl is placed in a container with solvents in an inverted position. The bowl brush is inserted and worked with a pumping action. To check the discharge ports, lift the bowl out of the solvent and make sure solvent is draining from all the discharge ports. These ports must be clean and to aid in keeping them clean the use of a small brush or tightly coiled springs is recommended. When clean, the bowl should be thoroughly inspected with a light to assure cleanliness.



8. Tools for cleaning these units are few in number and of simple construction. In many installations the tools are supplemented by others which are more suitable to the specific application and solids encountered.



9. There are perhaps many ways to facilitate bowl cleaning. Here is just one of them which may help you with your cleaning operations. It can be fabricated quite easily and allows the bowl to be flushed with hot water and/or steam. The bowl is placed in the tank over the pipe and rests on wooden slats which are placed in the bottom to protect the bowl bottom. In some cases, this water or steam jet is all that it takes to dislodge residue in the bowl.

Detroit Diesel's "51" Series Engine

Detroit Diesel Engine Division of GM goes both ways. Expanding their engine line from the highly successful and ubiquitous Series 71 engine, they first introduced the higher horsepower 110 Series. Now, upon the occasion of the National Motor Boat Show in New York City, they unveiled the smaller 51 Series engine.

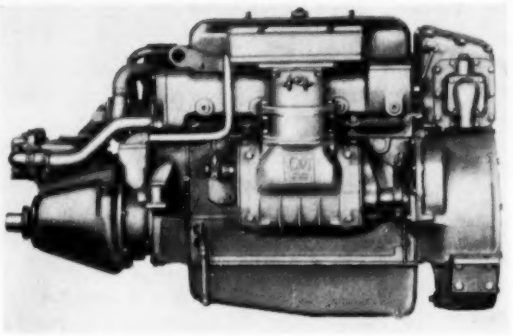
This is Detroit Diesel's bid in the field of smaller, more compact, simpler diesels. The first showing was a marine model but, reasonably, other applications will follow. One unit shown was a 4-cyl model, developing 87 hp at 3000 rpm.

The engine is "square", both bore and stroke being 4.1 in. Total displacement is 216 cu in, and the compression ratio is 18:1. Length is 49¼ in; overall height—31 in; width overall—26¾ in.

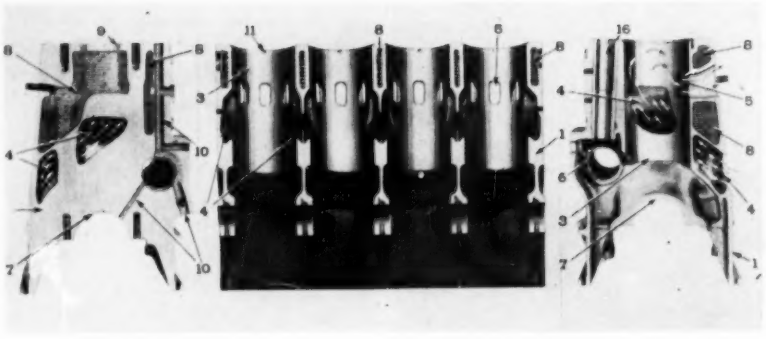
Loop scavenging, eliminating valve gear, promotes simplicity. A Roots-type blower supplies scavenging air.

Other features illustrated include a 4-lb pneumatic governor and a uniquely mounted lube oil pump.

Pattern of things to come is indicated in a 2-cyl model driving the permanent magnet rotating field of a generator. Without even slip rings, only normal engine maintenance is required for this unit.

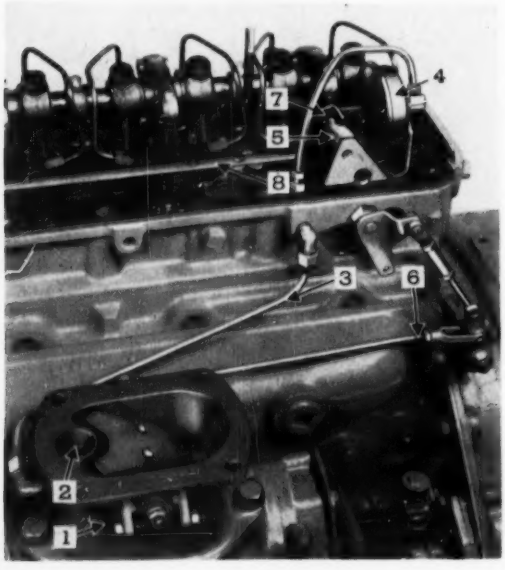


Marine version of GM's 4-cyl Series "51" engine. Illustrating compactness, this model had overall length of 49¼ in; overall height—31 in (21¼ in above shaft center); width overall—26¾ in (22½-in bolt centers).



Cutaway drawing showing air, water and oil passages in block and loop scavenging in cylinders.

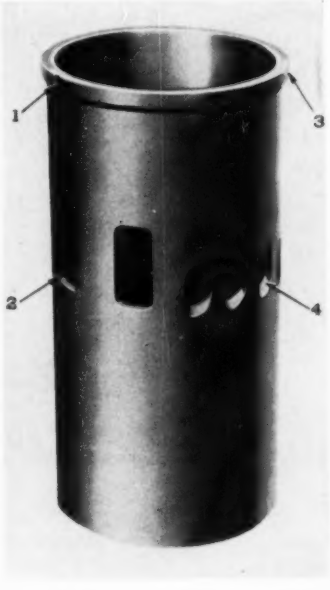
1. *Cylinder block*
3. *Cylinder liner*
4. *Air intake passage*
5. *Exhaust ports*
6. *Camshaft bearing*
7. *Upper main bearing support*
8. *Cooling water jacket*
9. *Block to head water passage*
10. *Oil passage*
11. *Liner locating dowel hole*
12. *Sleeve cam follower hole*



Pneumatic governor has no rotating parts to wear. Air passing through air valve housing (1) and venturi (2) sets up vacuum in tubing (3) operating diaphram in housing (4). Diaphram pulls against injector control spring (5) through control lever (7) Tendency of spring to increase fuel by moving control rack (8) is balanced by diaphram pull. Speed is maintained as set by air control lever (6) despite load fluctuations.

Dry-type liner showing intake and exhaust ports.

1. *Notch for retaining dowel*
2. *Exhaust ports*
3. *Block-seating liner flange*
4. *Intake ports*



THE BUYERS' GUIDE

The Buyers' Guide is a service to our readers and to advertisers in Diesel Power and Diesel Transportation. *Here will be found in a convenient list for quick reference diesel engines and accessories advertised in this magazine and a substantial number of other engines and products of leading manufacturers who advertise in this classified directory.*

DIESEL ENGINE DIRECTORY

Two-Cycle Diesel Engines

LOW SPEED, up to 365 r.p.m.

Horsepower, 101 to 500

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

SULZER BROTHERS LTD., NEW YORK
50 Church Street
New York, N. Y.

Horsepower, 501 to 1000

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

SULZER BROTHERS LTD., NEW YORK
50 Church Street
New York, N. Y.

Horsepower, Over 1000

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

SULZER BROTHERS LTD., NEW YORK
50 Church Street
New York, N. Y.

MEDIUM SPEED, 365 to 700 r.p.m.

Horsepower, 51 to 100

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

Horsepower, 101 to 500

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

Horsepower, 501 to 1000

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

Horsepower, over 1000

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, New York

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

MEDIUM HIGH SPEED, 700 to 1200 r.p.m.

Horsepower, 1 to 50

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

Horsepower, 51 to 100

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

Horsepower, 101 to 500

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, New York

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

Horsepower, 501 to 1000

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

Horsepower, over 1000

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, New York

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

HIGH SPEED, over 1200 r.p.m.

Horsepower, 1 to 50

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

Horsepower, 51 to 100

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

Horsepower, 101 to 500

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

Horsepower, 501 to 1000

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

Four-Cycle Diesel Engines

LOW SPEED, up to 365 r.p.m.

Horsepower, 51 to 100

WHITE-ROTH CORP.
Lorain, Ohio

Horsepower, 101 to 500

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

THE UNION DIESEL ENGINE CO.
2121 Diesel St.
Oakland 6, California

WORTHINGTON CORP.
Harrison, New Jersey

Horsepower, 501 to 1000

BRUSH ABOE, INC.
350 Fifth Avenue
New York 1, N. Y.

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

CHICAGO PNEUMATIC TOOL COMPANY
6 East 44th Street
N. Y., N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

FULTON IRON WORKS CO.
1259 Delaware Ave.
St. Louis 14, Mo.

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

THE UNION DIESEL ENGINE CO.
2121 Diesel St.
Oakland 6, California

WORTHINGTON CORP.
Harrison, New Jersey

Horsepower, over 1000

BRUSH ABOE, INC.
350 Fifth Avenue
New York 1, N. Y.

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

CHICAGO PNEUMATIC TOOL COMPANY
6 East 44th Street
N. Y., N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

FULTON IRON WORKS CO.
1259 Delaware Ave.
St. Louis 14, Mo.

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Ave.
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

THE UNION DIESEL ENGINE CO.
2121 Diesel St.
Oakland 6, California

WORTHINGTON CORP.
Harrison, New Jersey

MEDIUM SPEED, 365 to 700 r.p.m.

Horsepower, 1 to 50

CONTINENTAL MOTORS CORP.
Muskegon, Mich.

WHITE-ROTH CORP.
Lorain, Ohio

WITTE ENGINE WORKS
OIL WELL SUPPLY DIVISION of UNITED STATES STEEL COMPANY
Kansas City 26, Missouri

Horsepower, 51 to 100

BURMEISTER & WAIN AMERICAN CORP
17 Battery Place
New York 4, N. Y.

CONTINENTAL MOTORS CORP.
Muskegon, Mich.

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

Horsepower, 101 to 500

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

THE BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

CHICAGO PNEUMATIC TOOL COMPANY
6 East 44th Street
New York, N. Y.

CONTINENTAL MOTORS CORP.
Muskegon, Mich.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

HERCULES MOTORS CORPORATION
11th & Market S. E.
Canton 2, Ohio

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

STERLING ENGINE CO.
1270 Niagara Street
Buffalo 13, N. Y.

SULZER BROTHERS LTD., NEW YORK
50 Church Street
New York, N. Y.

THE UNION DIESEL ENGINE CO.
2121 Diesel St.
Oakland 6, Calif.

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

WORTHINGTON CORP.
Harrison, New Jersey

Horsepower, 501 to 1000

AMERICAN LOCOMOTIVE COMPANY
Schenectady 5, N. Y.

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BRUSH ABOE, INC.
350 Fifth Avenue
New York 1, N. Y.

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

CHICAGO PNEUMATIC TOOL COMPANY
6 East 44th Street
N. Y., N. Y.

COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Ave.
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

STERLING ENGINE COMPANY
1270 Niagara Street
Buffalo 13, N. Y.

SULZER BROTHERS LTD., NEW YORK
50 Church Street
New York, N. Y.

THE UNION DIESEL ENGINE CO.
2121 Diesel St.
Oakland 6, California

WORTHINGTON CORP.
Harrison, New Jersey

Horsepower, over 1000

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BRUSH ABOE, INC.
350 Fifth Avenue
New York 1, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

THE NATIONAL SUPPLY COMPANY
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

STERLING ENGINE COMPANY
1270 Niagara Street
Buffalo 13, N. Y.

SULZER BROTHERS LTD., NEW YORK
50 Church Street
New York, N. Y.

WORTHINGTON CORP.
Harrison, New Jersey

MEDIUM HIGH SPEED 700 to 1200 r.p.m.

Horsepower, 1 to 50

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

CONTINENTAL MOTORS CORP.
Muskegon, Mich.

FAIRBANKS, MORSE & CO.
600 So. Michigan Ave.
Chicago 5, Illinois

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

WITTE ENGINE WORKS
OIL WELL SUPPLY DIVISION
of UNITED STATES STEEL CO.
1600 Oakland Avenue
Kansas City 3, Mo.

Horsepower, 51 to 100

BRUSH ABOE, INC.
350 Fifth Avenue
New York 1, N. Y.

BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

CONTINENTAL MOTORS CORP.
Muskegon, Mich.

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Streets
San Francisco 10, California

FAIRBANKS, MORSE & CO.
600 So. Michigan Ave.
Chicago 5, Illinois

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

STERLING ENGINE CO.
1270 Niagara St.
Buffalo 13, N. Y.

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

Horsepower, 101 to 500

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BRUSH ABOE, INC.
350 Fifth Avenue
New York 1, N. Y.

BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois

CHICAGO PNEUMATIC TOOL COMPANY
6 East 44th Street
N. Y., N. Y.

CONTINENTAL MOTORS CORP.
Muskegon, Mich.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

CUMMINS ENGINE COMPANY, INC.
Columbus, Indiana

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

INGERSOLL-RAND CO.
11 Broadway
New York, N. Y.

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

STERLING ENGINE COMPANY
1270 Niagara St.
Buffalo 13, N. Y.

THE UNION DIESEL ENGINE CO.
2121 Diesel St.
Oakland 6, Calif.

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

Horsepower, 501 to 1000

AMERICAN LOCOMOTIVE COMPANY
Schenectady 5, N. Y.

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BRUSH ABOE, INC.
350 Fifth Avenue
New York 1, N. Y.

CHICAGO PNEUMATIC TOOL COMPANY
6 East 44th Street
N. Y., N. Y.

COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.

THE NATIONAL SUPPLY CO.
DIESEL DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Ave.
Springfield 99, Ohio

NORDBERG MANUFACTURING COMPANY
3037 S. Chase Avenue
Milwaukee 1, Wisconsin

STERLING ENGINE COMPANY
1270 Niagara St.
Buffalo 13, N. Y.

Horsepower, over 1000

AMERICAN LOCOMOTIVE COMPANY
Schenectady 5, N. Y.

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BRUSH ABOE, INC.
350 Fifth Avenue
New York 1, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

NORDBERG MANUFACTURING COMPANY
3037 S. Chase Avenue
Milwaukee 1, Wisconsin

STERLING ENGINE COMPANY
1270 Niagara Street
Buffalo 13, N. Y.

HIGH SPEED, over 1200 r.p.m.

Horsepower, 1 to 50

BRUSH ABOE, INC.
350 Fifth Avenue
New York 1, N. Y.

CONTINENTAL MOTORS CORP.
Muskegon, Mich.

FAIRBANKS, MORSE & CO.
600 So. Michigan Ave.
Chicago 5, Illinois

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

HILL DIESEL ENGINE CORP.
238 Mill Street
Lansing 3, Michigan

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

WITTE ENGINE WORKS
OIL WELL SUPPLY DIVISION
of UNITED STATES STEEL CO.
1600 Oakland Avenue
Kansas City 3, Mo.

Horsepower, 51 to 100

BRUSH ABOE, INC.
350 Fifth Avenue
New York 1, N. Y.

BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois

CONTINENTAL MOTORS CORP.
Muskegon, Mich.

CUMMINS ENGINE CO., INC.
Columbus, Indiana

FAIRBANKS, MORSE & CO.
600 So. Michigan Ave.
Chicago 5, Illinois

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

HILL DIESEL ENGINE CORP.
238 Mill Street
Lansing 3, Michigan

STERLING ENGINE COMPANY
1270 Niagara Street
Buffalo 13, N. Y.

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

Horsepower, 101 to 500

BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois

CONTINENTAL MOTORS CORPORATION
Muskegon, Michigan

CUMMINS ENGINE CO., INC.
Columbus, Indiana

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

STERLING ENGINE COMPANY
1270 Niagara Street
Buffalo 13, N. Y.

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

Horsepower, 501 to 1000

CUMMINS ENGINE CO., INC.
Columbus, Indiana

STERLING ENGINE COMPANY
1270 Niagara Street
Buffalo 13, N. Y.

Horsepower, over 1000

STERLING ENGINE COMPANY
1270 Niagara Street
Buffalo 13, N. Y.

DIESEL PLANT ACCESSORIES

Adapters, Engine Indicator

BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Pa.

Aftercoolers, Air Compressor

See also "Headings under Coolers"

AEROFIN CORPORATION
410 S. Geddes Street
Syracuse 1, New York

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

CHICAGO PNEUMATIC TOOL COMPANY
6 East 44 Street
New York, New York

DAVIS ENGINEERING COMPANY
1064 East Grand Street
Elizabeth 4, New Jersey

INGERSOLL-RAND COMPANY
11 Broadway
New York 4, N. Y.

KEWANEE-ROSS CORPORATION
1405 West Avenue
Buffalo 13, New York

THE TRANE COMPANY
LaCrosse, Wisconsin

HENRY VOGT MACHINE CO.
1000 West Ormsby Street
Louisville 10, Kentucky

YOUNG RADIATOR CO.
Racine, Wisconsin

Aftercoolers, Supercharger

See also "Supercharging Intercoolers"

HARRISON RADIATOR DIVISION
General Motors Corporation
Washburn Street
Lockport, New York

THE TRANE COMPANY
LaCrosse, Wisconsin

YOUNG RADIATOR CO.
Racine, Wisconsin

Air Cleaner Connectors

AMERICAN VENTILATING HOSE COMPANY
Division of
Callahan Zinc-Lead Company, Inc.
100 Park Avenue
New York 17, New York

Air Cleaners

See also "Air Filters"; "Filters, Air"; etc.

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

Air Cleaners, Oil Washed

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

Air Compressors

See also "Compressors, Air"; "Starting Units".

WORTHINGTON CORPORATION
Harrison, New Jersey

Air Compressors, Diesel Driven

FAIRBANKS, MORSE & CO.
600 S. Michigan Avenue
Chicago 5, Illinois

Air Compressors, Starting

FAIRBANKS, MORSE & CO.
600 S. Michigan Avenue
Chicago 5, Illinois

WORTHINGTON CORPORATION
Harrison, New Jersey

Air Dryers, Instrument

J. F. PRITCHARD & COMPANY
210 W. 10 Street
Kansas City 5, Missouri

Air Filters

See also "Air Cleaners; Cleaners; Filters, Air"

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

BURGESS-MANNING COMPANY
749 East Park Avenue
Libertyville, Illinois

CONTINENTAL AIR FILTERS, INC.
2520 Helm Street
Louisville 1, Kentucky

VORTOX MANUFACTURING COMPANY
121 South Alexander
Claremont, California

Air Filters, Automatic, Self-Cleaning

AMERICAN AIR FILTER CO., INC.
445 Central Avenue
Louisville 8, Kentucky

CONTINENTAL AIR FILTERS COMPANY
2520 Helm Street
Louisville 1, Kentucky

Air Filters, Crankcase

See also head under "Breathers," etc.

FRAM CORP.
Providence 16, R. I.

Air Inlet Grilles

BARBER-COLMAN COMPANY
1300 Rock Street
Rockford, Illinois

Air Starting Motor, Diesel Engine

See also "Starting Motors, Diesel Air" "Cranking Motors, Air"

LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

SCHWITZER-CUMMINS COMPANY
1125 Massachusetts Avenue
Indianapolis 7, Indiana

Air Tools

CLECO DIVISION
Reed Roller Bit Company
5125 Clinton Drive
Houston 20, Texas

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.

Air Velocity Meters

BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Pa.

ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle Street
Chicago 10, Ill.

Alarm Systems, Pressure & Temperature

See also headings under "Controls & Automatic"

FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tennessee

ILLINOIS TESTINGS LABORATORIES, INC.
420 North LaSalle Street
Chicago 40, Illinois

PENN CONTROLS INC.
Goshen, Indiana

ROCHESTER MFG. CO., INC.
101 Rockwood St.
Rochester 10, N. Y.

SYNCHRO-START PRODUCTS, INC.
8151 North Ridgeway Avenue
Skokie, Illinois

THE UNION DIESEL ENGINE COMPANY
2121 Diesel Street
Oakland 6, California

Alternators

LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

MARATHON ELECTRIC MANUFACTURING CO.
Wausau, Wisconsin

Alumibond Pistons

ARTHUR TICKLE ENGINEERING WORKS
21 Delevan Street
Brooklyn 31, N. Y.

Ammeters

See also "Meters, Electrical Indicating".

BURLINGTON INSTRUMENT CO.
203 N. 3rd St.
Burlington, Iowa

ROCHESTER MFG. CO., INC.
101 Rockwood St.
Rochester 10, N. Y.

WESTON ELECTRICAL INSTRUMENT CO.
614 Frelinghuysen Ave.
Newark 5, N. J.

Ammeters—Tong Test (Clamp On) Type

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave.
Cleveland 14, Ohio

HERMAN H. STICHT CO., INC.
27 Park Place
New York 7, New York

WESTON ELECTRICAL INSTRUMENT CO.
614 Frelinghuysen Ave.
Newark 5, N. J.

Anti-Rust Compounds

See also "Rust Preventatives"

CITIES SERVICE OIL CO.
60 Wall Tower
New York 5, N. Y.

Asbestos, Sheet

See also headings under "Gaskets"

FITZGERAL MANUFACTURING CO.
Torrington, Connecticut

VICTOR MANUFACTURING & GASKET CO.
5750 Roosevelt Avenue
Chicago, Illinois

Automatic Controls,

See also headings under "Controls" and below.

Automatic Controls, Starting

SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Avenue
Skokie, Illinois

Automatic Controls, Temperature

BARBER-COLMAN COMPANY
1300 Rock Street
Rockford, Illinois

FULTON SYLPHON DIVISION
ROBERTSHAW—FULTON CONTROLS CO.
Knoxville 4, Tennessee

PENN CONTROLS, INC.
Goshen, Indiana

Automotive Diesel Fuel

See also "Fuel Oil, Diesel"; "Oils, Diesel Fuel"; "Diesel Fuel Oils"; "Motor Fuels"

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street
San Francisco 20, California

THE TEXAS COMPANY
135 East 42nd Street
New York 17, N. Y.

Automotive Greases

See also "Greases," "Lubricants"

PURE OIL COMPANY
35 East Wacker Drive
Chicago, Illinois

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street
San Francisco 20, California

THE TEXAS COMPANY
135 E. 42 Street
New York 17, N. Y.

Automotive Lubricating Oils

See also "Lubricating Oils"; "Oils, Lubricating"

PURE OIL COMPANY
35 East Wa ker Drive
Chicago, Illinois

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street
San Francisco 20, California

THE TEXAS CO.
135 East 42nd St.
New York 17, N. Y.

TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, N. Y.

Auxiliary Combination Units

FAIRBANKS, MORSE & CO.
600 S. Michigan Avenue
Chicago 5, Illinois

GRIFFIN EQUIPMENT CORP.
880 E. 141 Street
New York, New York

Auxiliary Diesel Generating Sets

See also "Diesel Generating Sets"; "Emergency Diesel Generator"; "Emergency Lighting Plants".

CUMMINS ENGINE COMPANY
Columbus, Indiana

Babbitt Metal

ARTHUR TICKLE ENGINEERING WORKS
21 Delevan Street
Brooklyn 31, N. Y.

Balancing Machines

ARTHUR TICKLE ENGINEERING WORKS
21 Delevan Street
Brooklyn 31, N. Y.

Ball & Roller Bearing Greases

TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, N. Y.

Bars, Bronze

See also headings under "Bronze"

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

Bases, Welded

GRAVER TANK & MFG. CO., INC.
East Chicago, Indiana

Batteries, Diesel Locomotive

See also "Starting Batteries, Storage", other headings this page

ELECTRIC STORAGE BATTERY CO.
42 South 15 Street
Philadelphia 2, Pa.

Batteries, Diesel Starting

See also "Starting Batteries, Storage"

ELECTRIC STORAGE BATTERY CO.
42 South 15 Street
Philadelphia 2, Pa.

Batteries, Marine Storage

ELECTRIC STORAGE BATTERY CO.
42 South 15 Street
Philadelphia 2, Pa.

Batteries, Stationary Storage

ELECTRIC STORAGE BATTERY CO.
42 South 15 Street
Philadelphia 2, Pa.

Batteries, Storage

SURRETTE STORAGE BATTERY CO., INC.
Jefferson Avenue
Salem, Massachusetts

Battery Charging Regulator

ELECTRIC REGULATOR CORPORATION
Pearl Street
Norwalk, Connecticut

Battery Service Accessories

ELECTRIC STORAGE BATTERY CO.
42 South 15 Street
Philadelphia 2, Pa.

Batteries, Storage, Nickel Cadmium

NIFE, INC.
Strong Avenue & Third Street
Copiague, Long Island, N. Y.

Bearings

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland, Ohio

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

Bearings, Aluminum

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

ARTHUR TICKLE ENGINEERING WORKS
21 Delevan Street
Brooklyn 31, N. Y.

Bearings, Babbitted

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland, Ohio

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

Bearings, Babbitted and Bronze Bushed

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland, Ohio

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

Bearings, Bronze

See also "Bronze Bearings"

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

Bearings, Bronze and Steel, Babbitt-Lined

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

DETROIT ALUMINUM & BRASS CORP.
3975 Christopher Ave.
Detroit, Michigan

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

ARTHUR TICKLE ENGINEERING WORKS
21 Delevan Street
Brooklyn 31, N. Y.

Bearings, Copper-Lead

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

DETROIT ALUMINUM & BRASS CORP.
3975 Christopher Ave.
Detroit, Michigan

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

Bearings, Lead, Bronze

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

Bearings, Piston Pin

See "Bearings Wrist Pin"

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Mich.

JOHNSON BRONZE CO.
470 S. Mill St.
New Castle, Pa.

Bearings Rebabbitted

SIGURD GOLTEN MACHINE CORP.
455 Carroll Street
Brooklyn 15, N. Y.

Bearings, Self-Lubricating

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

Bearings, Sleeve, Copper-Lead Lined

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

Bearings, Special Alloys

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

Bearings, Steel-Backed, Copper-Lead Lined

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

DETROIT ALUMINUM & BRASS CORP.
3975 Christopher Ave.
Detroit, Michigan

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

Bearings, Wrist Pin

See also "Bearings, Piston Pin"

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

Bellows, Brass

FLEXONICS CORPORATION
1315 S. Third Avenue
Maywood, Illinois

Bellows, Stainless Steel

FLEXONICS CORPORATION
1315 S. Third Avenue
Maywood, Illinois

Blocks, Welded

GRAVER TANK & MANUFACTURING CO.
4809 Tod Avenue
East Chicago, Illinois

Blowers, Centrifugal

INGERSOLL-RAND COMPANY
11 Broadway
New York, N. Y.

Blowers, Rotary, Positive

READ STANDARD CORPORATION
370 Lexington Avenue
New York 17, N. Y.

Blowers, Scavenging and Supercharging

ELLIOTT COMPANY
Jeannette, Pennsylvania

READ STANDARD CORPORATION
370 Lexington Avenue
New York 17, N. Y.

Boilers, Exhaust Gas, Waste Heat

See also "Waste Heat Boilers"

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

THE SIMS COMPANY
1402 E. 18th St.
Erie, Pa.

Boring Bars

VAN NORMAN COMPANY
AUTOMOTIVE DIVISION
Springfield 7, Mass.

Brazing Equipment Induction

OHIO CRANKSHAFT COMPANY
3800 Harvard Ave.
Cleveland 1, Ohio

Breather Filters

See also, "Air Filters, Crankcase"

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul 4, Minn.

VORTOX MANUFACTURING COMPANY
121 South Alexander
Claremont, California

Breathers, Crankcase

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

Bronze Bar Stock

See also "Bars, Bronze"

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

Bronze Bearings

See also "Bearings, Bronze"

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Mich.

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

Bronze Washers

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Mich.

JOHNSON BRONZE CO.
470 South Mill Street
New Castle, Pa.

Buildings, Crane

LURIA ENGINEERING COMPANY
500 Fifth Avenue
New York, N. Y.

Buildings, Prefabricated

LURIA ENGINEERING COMPANY
500 Fifth Avenue
New York, N. Y.

Buildings, Steel

LURIA ENGINEERING COMPANY
500 Fifth Avenue
New York, N. Y.

Burner Oils

MID-CONTINENT PETROLEUM CORP.
Box 381
Tulsa, 2, Oklahoma

Bushings, High-Lead Bronze

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

Bushings, Bronze

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

FEDERAL-MOGUL CORP.
11031 Shoemaker Ave.
Detroit 13, Michigan

Bushings, Lead-Bronze Lined

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

Bushings, Split Rolled

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio
FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

Bushings, Steel-Backed, Babbitt-Lined

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland 10, Ohio
FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

Cables, Battery

THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio
ELECTRIC STORAGE BATTERY CO.
42 South 15 Street
Philadelphia 2, Pa.

Cam Followers

EATON MANUFACTURING CO.
740 East 140th Street
Cleveland 10, Ohio

Camshaft Drives, Roller Chain Type

MORSE CHAIN COMPANY
7601 Central
Detroit 10, Michigan

Camshafts, Finished

OHIO CRANKSHAFT COMPANY
3800 Harvard Avenue
Cleveland 1, Ohio

Carbon Brushes

NATIONAL CARBON COMPANY
30 East 42nd Street
New York, N. Y.

Carbon Solvents

OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.

Castings

HUNT-SPILLER MFG. COMPANY
383 Dorchester Avenue
Boston 27, Mass.

Casting Repairs

WASHINGTON IRON WORKS
Sherman, Texas

Castings, Grey Iron

EATON MANUFACTURING CO.
740 East 140th Street
Cleveland 10, Ohio

Castings, Steel (Med & Large)

ERIE FORGE & STEEL CORPORATION
15 & Cascade Streets
Erie, Pennsylvania

Centrifugal Purifiers, Lube & Fuel Oil

See also headings under "Conditioners"; Purifiers"; and "Separators"

CENTRICO, INC.
75 Forest Ave.
Englewood, New Jersey
THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.
THE SHARPLES CORP.
2300 Westmoreland St.
Philadelphia 40, Pa.

Centrifuges, Oil Purifying

See heading above.

CENTRICO, INC.
75 Forest Ave.
Englewood, New Jersey
THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.
THE SHARPLES CORP.
2300 Westmoreland St.
Philadelphia 40, Pa.

Chain Drives, Complete

LINK-BELT COMPANY
220 S. Belmont Avenue
Indianapolis 6, Indiana

Chains, Dual Engine Drive

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana
MORSE CHAIN COMPANY
7601 Central
Detroit 10, Michigan

Chains, Power Transmission

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana
MORSE CHAIN COMPANY
7601 Central
Detroit 10, Michigan

Chains, Roller

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana
MORSE CHAIN COMPANY
7601 Central
Detroit 10, Michigan

Chains, Silent

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana
MORSE CHAIN COMPANY
7601 Central
Detroit 10, Michigan

Chains, Timing

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana
MORSE CHAIN COMPANY
7601 Central
Detroit 10, Michigan

Chargers, Battery

ELECTRIC STORAGE BATTERY CO.
42 South 15 Street
Philadelphia 2, Pa.

Chromium Plating

NATIONAL WELDING & GRINDNG CO.
2929 Canton Street
Dallas 1, Texas
VAN DER HORST CORP. OF AMERICA
P. O. Box 557
Olean, N. Y.

Chromium Treated Parts

SPAR-TAN ENGINEERING COMPANY
Western Licensee—Van Der Horst Corp.
2445 Enterprise Street
Los Angeles 21, California

Clamps, Hose & General Connection

EATON MANUFACTURING COMPANY
740 East 140 Street
Cleveland 10, Ohio

Clarifiers, Oil

See also headings under "Centrifugal"; "Purifiers"; and "Separators"

CENTRICO, INC.
75 Forest Ave.
Englewood, New Jersey
U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
Thompson Road
Syracuse 6, New York

Cleaners, Air, Oil Bath Type

See also headings under "Filters, Air" and "Silencers"

AMERICAN AIR FILTER CO., INC.
445 Central Avenue
Louisville 8, Kentucky
DONALDSON COMPANY, INC.
666 Pelham Boulevard
St. Paul 4, Minnesota
VORTOX COMPANY
121 South Alexander
Claremont, California

Cleaners, Dry Type

BURGESS-MANNING COMPANY
749 East Park Avenue
Libertyville, Illinois

Cleaning Compounds

See also headings under "Cleaners"; "Coolers"; and "Exchangers"

KELITE PRODUCTS, INC.
P. O. Box 2917
Terminal Annex Station
Los Angeles 54, California
OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.

Clutch Discs

ROCKFORD CLUTCH DIVISION
BORG WARNER CORP.
1301 18th Avenue
Rockford, Illinois

Clutches

ROCKFORD CLUTCH DIVISION
BORG-WARNER CORP.
1301 18th Ave.
Rockford, Illinois

Clutches, Automotive

ROCKFORD CLUTCH DIVISION
BORG WARNER CORP.
1301 18th Avenue
Rockford, Illinois

Clutches, Free Wheeling

MORSE CHAIN COMPANY
7601 Central
Detroit 10, Michigan

Clutches, Friction and Jaw

ROCKFORD CLUTCH DIVISION
BORG WARNER CORP.
1301 18th Avenue
Rockford, Illinois

Clutches, Power Transmission

EATON MANUFACTURING COMPANY
740 East 140 Street
Cleveland 10, Ohio
ROCKFORD CLUTCH DIVISION
BORG WARNER CORP.
1301 18th Avenue
Rockford, Illinois
SNOW-NABSTEDT GEAR CORP.
251 Welton Street
Hamden, Connecticut

Combustion, Diesel

LANOVA CORP.
38-15 30th Street
Long Island City 1, N. Y.

Combustion Systems, Designs

LANOVA CORP.
38-15 30th St.
Long Island City 1, N. Y.

Compression Testers, Diesel Engine

See also "Indicators, Diesel Engine".

BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Ave.
Pittsburgh 8, Pa.

ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Avenue
Chicago 40, Illinois

KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Ave.
Franklin Park, Illinois

Compressors, Air

See also "Air Compressors"; "Starting Units"

CHICAGO PNEUMATIC TOOL CO.
6 East 44th Street
New York, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

INGERSOLL-RAND COMPANY
11 Broadway
New York 4, N. Y.

QUINCY COMPRESSOR CO.
217 Maine Street
Quincy, Illinois

READ STANDARD CORP.
370 Lexington Ave.
New York 17, N. Y.

WORTHINGTON CORP.
Harrison, New Jersey

Compressor Oils

MID-CONTINENT PETROLEUM CORP.
Box 381
Tulsa 2, Oklahoma

Compressors, Reciprocating, Air and Gas, All Drives

CHICAGO PNEUMATIC TOOL COMPANY
6 East 44th Street
New York, N. Y.

THE COOPER-BESSEMER CORP.
Mount Vernon, Ohio

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.

WORTHINGTON CORP.
Harrison, New Jersey

Condensers, Atmospheric Evaporative Steam & Vapor

YOUNG RADIATOR COMPANY
Racine, Wisconsin

Conditioners, Fuel & Lube Oil

DE LAVAL SEPARATOR COMPANY
Poughkeepsie, N. Y.

HILLIARD CORPORATION
120 West 4th Street
Elmira, N. Y.

U. S. HOFFMAN MACHINERY CORPORATION
Filtration Division
Thompson Road
Syracuse 6, New York

Connecting Rods

ELLWOOD CITY FORGE CO.
Ellwood City, Pa.

Connecting Rod Pin Bushing Borer

LEMPCO PRODUCTS, INC.
Dunham Road
Bedford, Ohio

Conecting Rods, Forged

ERIE FORGE & STEEL CORPORATION
15 & Cascade Streets
Erie, Pennsylvania

Controls, Automatic Starting

See also "Automatic Controls"; "Alarm Systems"

SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Ave.
Skokie, Illinois

Controls, Electrical

AUTOMATIC SWITCH COMPANY
391 Lakeside Avenue
Orange, New Jersey

Controls, Engine Safety

DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin

FULTON-SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Kentucky

PENN CONTROLS, INC.
Goshen, Indiana

PIERCE GOVERNOR COMPANY
1625 Ohio Ave.
Anderson, Indiana

SYNCHRO-START PRODUCTS INC.
8151 N. Ridgeway Avenue
Skokie, Illinois

Controls, Fuel Governing Reverse Gear

PICKERING GOVERNOR COMPANY
Paramus, New Jersey

PIERCE GOVERNOR COMPANY
1625 Ohio Ave.
Anderson, Indiana

Controls, Hydraulic

PICKERING GOVERNOR COMPANY
Paramus, New Jersey

THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois

Controls, Liquid Level

THE MERCOID CORP.
4201 Belmont Ave.
Chicago, Illinois

PENN CONTROLS, INC.
Goshen, Indiana

Controls, Locomotive

GENERAL ELECTRIC COMPANY
1 River Road
Schenectady 5, N. Y.

Controls, Power-Air Hydraulic, Vacuum, Electric

BARBER-COLMAN COMPANY
1300 Rock Street
Rockford, Illinois

Controls, Pneumatic

THE POWERS REGULATOR COMPANY
3410 Oakton Street
Skokie, Illinois

Controls, Pressure

BARBER-COLMAN COMPANY
1300 Rock Street
Rockford, Illinois

THE MERCOID CORP.
4201 Belmont Ave.
Chicago, Illinois

PENN CONTROLS, INC.
Goshen, Indiana

ROCHESTER MFG. CO., INC.
101 Rockwood St.
Rochester 10, N. Y.

Controls, Remote

BARBER-COLMAN COMPANY
1300 Rock Street
Rockford, Illinois

Controls, Temperature

AMERICAN MOTORS CO.
21 Nevins Avenue
Richmond 5, California

BARBER-COLMAN COMPANY
1300 Rock Street
Rockford, Illinois

DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin

FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tennessee

THE MERCOID CORP.
4201 Belmont Ave.
Chicago, Illinois

PENN CONTROLS, INC.
Goshen, Indiana

THE POWERS REGULATOR CO.
3410 Oakton St.
Skokie, Illinois

ROCHESTER MFG. CO., INC.
101 Rockwood St.
Rochester 10, N. Y.

Controls, Vacuum

PENN CONTROLS, INC.
Goshen, Indiana

Coolers, Compressed Air, Gas

See also "Aftercoolers"

AEROFIN CORPORATION
410 S. Geddes Street
Syracuse 4, N. Y.

YOUNG RADIATOR CO.
Racine, Wisconsin

Coolers, Evaporative Type

See headings under "Evaporators".

FAIRBANKS, MORSE & CO.
600 S. Michigan Avenue
Chicago 5, Illinois

THE TRANE CO.
La Crosse, Wisconsin

WORTHINGTON CORP.
Harrison, New Jersey

YOUNG RADIATOR COMPANY
Racine, Wisconsin

Coolers, Jacket Water

See also "Exchangers, Heat"; "Water Cooling Equipment"; and headings under "Heat Exchangers".

AEROFIN CORPORATION
410 S. Geddes St.
Syracuse 1, N. Y.

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

DAVIS ENGINEERING CORP.
1064 E. Grand St.
Elizabeth, 4 New Jersey

HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, New York

KEWANEE-ROSS CORPORATION
1405 West Avenue
Buffalo 13, New York

J. F. PRITCHARD & CO.
210 West 10 Street
Kansas City 5, Missouri

THE TRANE CO.
La Crosse, Wisconsin

HENRY VOGT MACHINE CO.
1000 West Ormsby St.
Louisville 10, Ky.

YOUNG RADIATOR CO.
Racine, Wisconsin

Coolers, Jacket Water, Materials For Cleaning

See also "Cleaning Compounds"; and "Cleaner"

YOUNG RADIATOR CO.
Racine, Wisconsin

Coolers, Lube Oil, Materials For Cleaning

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

Coolers, Oil and Water

See also "Oil Coolers"; "Water Cooling Equipment"; "Exchangers, Heat" and headings under "Heat Exchangers".

AEROFIN CORPORATION
410 S. Geddes St.
Syracuse 1, N. Y.

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

DAVIS ENGINEERING CORP.
1064 East Grand Street
Elizabeth 4, New Jersey

HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, New York

KEWANEE-ROSS CORPORATION
1405 West Avenue
Buffalo 13, New York

THE TRANE COMPANY
La Crosse, Wisconsin

YOUNG RADIATOR CO.
Racine, Wisconsin

Cooling Equipment, Engine Radiators

SCHWITZER-CUMMINS CO.
1125 Msasachusetts Avenue
Indianapolis 7, Indiana

THE TRANE COMPANY
La Crosse, Wisconsin

YOUNG RADIATOR CO.
Racine, Wisconsin

Cooling Towers

See also "Spray Towers".

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.

THE MARLEY COMPANY, INC.
222 West Gregory Blvd.
Kansas City 5, Missouri

J. F. PRITCHARD & CO.
210 W. 10th Street
Kansas City 5, Missouri

Cooling Tower Fans

KOPPERS CO., INC.
Koppers Building
Pittsburgh 19, Penna.

J. F. PRITCHARD & CO.
210 W. 10 St.
Kansas City 5, Missouri

Cooling Water Treating Chemicals

D. W. HAERING & CO., INC.
P. O. Box 6037
Harlandale Station
San Antonio 4, Texas

Core Oils

CITIES SERVICE OIL CO.
60 Wall Tower
New York 5, N. Y.

SUN OIL COMPANY
1608 Walnut Street
Philadelphia, Pennsylvania

Corrosion Inhibitors

D. W. HAERING & CO., INC.
P. O. Box 6037
Harlandale Station
San Antonio 4, Texas

MUTUAL CHEMICAL CO. OF AMERICA
270 Madison Avenue
New York 16, N. Y.

Corrosion Inhibitors, Chromates

MUTUAL CHEMICAL CO. OF AMERICA
270 Madison Avenue
New York 16, N. Y.

Couplings

MORSE CHAIN COMPANY
7601 Central Avenue
Detroit, Michigan

Couplings, Chain

LINK-BELT CO.
220 So. Belmont Ave.,
Indianapolis, Ind.

MORSE CHAIN COMPANY
7601 Central
Detroit 10, Michigan

Couplings, Flexible

ELLIOTT COMPANY
Jeanette, Pennsylvania

KOPPERS CO., INC.
Koppers Building
Pittsburgh 19, Pa.

MORSE CHAIN COMPANY
7601 Central Avenue
Detroit, Michigan

THOMAS FLEXIBLE COUPLING CO.
P. O. Box 658
Warren, Pa.

Couplings, Flexible Shaft

KOPPERS CO., INC.
Koppers Building
Pittsburgh 19, Pa.

MORSE CHAIN COMPANY
7601 Central Avenue
Detroit, Michigan

Couplings, Floating Shaft Type

KOPPERS CO., INC.
Koppers Building
Pittsburgh 19, Pa.

MORSE CHAIN COMPANY
7601 Central Avenue
Detroit, Michigan

THOMAS FLEXIBLE COUPLING CO.
P. O. Box 658
Warren, Pa.

Couplings, Hydraulic

AERO-COUPLING CORPORATION
3015 Winona Avenue
Burbank, California

AEROQUIP CORP.
Jackson, Michigan

WEATHERHEAD COMPANY
300 East 131st Street
Cleveland 8, Ohio

Couplings, Hydraulic Pipe

AERO-COUPLING CORPORATION
3015 Winona Avenue
Burbank, California

AEROQUIP CORP.
Jackson, Michigan

Couplings, Roller Chain

LINK-BELT COMPANY
220 S. Belmont Avenue
Indianapolis 6, Indiana

MORSE CHAIN COMPANY
7601 Central Avenue
Detroit, Michigan

Couplings, Self-Aligning

KOPPERS CO., INC.
Koppers Building
Pittsburgh 19, Pa.

THOMAS FLEXIBLE COUPLING CO.
P. O. Box 658
Warren, Pa.

Couplings, Hydraulic, Self-Sealing

AERO-COUPLING CORPORATION
3015 Winona Avenue
Burbank, California

AEROQUIP CORP.
Jackson, Michigan

Couplings, Hydraulic, Self-Sealing, Quick Disconnect

AERO-COUPLING CORPORATION
3015 Winona Avenue
Burbank, California

AEROQUIP CORP.
Jackson, Michigan

Couplings, Self-Sealing

AERO-COUPLING CORPORATION
3015 Winona Avenue
Burbank, California

AEROQUIP CORP.
Jackson, Michigan

Couplings, Slip

EATON MANUFACTURING CO.
740 East 140th Street
Cleveland 10, Ohio

Crankcase Pressure Detector

ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Avenue
Chicago 40, Illinois

Cranking Motors, Air

See also "Air Starting Motors"; "Starting Motors Air"

LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Cranking Motors, Electric

See also "Starting Motors, Electric"

LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Crankshaft Grinders

LEMPCO PRODUCTS, INC.
Dunham Road
Bedford, Ohio

VAN NORMAN CO.
AUTOMOTIVE DIVISION
Springfield 7, Mass.

Crankshaft Machinists

ELLWOOD CITY FORGE CO.
Ellwood City, Pa.

NATIONAL WELDING & GRINDING COMPANY
2929 Canton Street
Dallas 1, Texas

WASHINGTON IRON WORKS
Sherman, Texas

Crankshafts

ELLWOOD CITY FORGE CO.
Ellwood City, Pa.

ERIE FORGE & STEEL COMPANY
15 & Cascade Streets
Erie, Pennsylvania

WYMAN-GORDON COMPANY
GENERAL OFFICE & WORKS, Worcester 1, Mass.
(INGALLS-SHEPARD DIVISION, Harvey, Ill.)
(GRAFTON DIVISION, N. Grafton, Mass.)

Crankshafts Built Up to Standard

BRODIE SYSTEM
115 Clifton Place
Brooklyn, New York

Crankshafts Finished

OHIO CRANKSHAFT COMPANY
3800 Harvard Avenue
Cleveland 1, Ohio

Crankshafts, Hand Chrome Surfaced

KOEPSEL & LOVE, INC.
47 East 7th South
Salt Lake City 2, Utah

Crankshafts Reground

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, New York
KOEPSEL & LOVE, INC.
47 East 7th South
Salt Lake City 2, Utah

Crankshafts, Repairs

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.
NATIONAL WELDING & GRINDING COMPANY
2929 Canton Street
Dallas 1, Texas
ARTHUR TICKLE ENGINEERING WORKS
21 Delevan St.
Brooklyn 31, N. Y.
WASHINGTON IRON WORKS
Sherman, Texas

Current Limiters

ELECTRIC REGULATOR CORPORATION
Pearl Street
Norwalk, Connecticut

Cutting Fluids

PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.
STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street
San Francisco 20, California
SUN OIL COMPANY
1608 Walnut Street
Philadelphia 3, Pennsylvania
THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

Cutting Oils

GULF OIL CORP.
GULF REFINING CO.
Gulf Building
Pittsburgh 30, Pa.
MID-CONTINENT PETROLEUM CORP.
Tulsa 2, Oklahoma
PHILLIPS PETROLEUM CORPORATION
Bartlesville, Oklahoma
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, New York
STANDARD OIL CO. (INDIANA)
910 So. Michigan Avenue
Chicago 80, Ill.
SUN OIL COMANY
1608 Walnut Street
Philadelphia 3, Pennsylvania
TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, N. Y.

Cylinder Heads

HUNT-SPILLER MFG. CORP.
383 Dorchester Avenue
Boston 27, Mass.

Cylinder Heads Repaired

NATIONAL WELDING & GRINDING COMPANY
2929 Canton Avenue
Dallas 1, Texas

Cylinder Liners

See also "Liners, Diesel Cylinder" and "Centrifugally Cast Cylinder Liners".
SEALED POWER CORP.
500 Sanford St.
Muskegon 61, Michigan

Cylinder Liners, Porous Chrome Reclaiming

SPAR-TAN ENGINEERING CO.
Western Licensee-Van Der Horst Corp.
2445 Enterprise Street
Los Angeles 21, California

Cylinder Liners Reclaimed

VAN DER HORST CORP. OF AMERICA
P. O. Box 557
Olean, N. Y.

Cylinder Liners Repaired

NATIONAL WELDING & GRINDING COMPANY
2929 Canton Avenue
Dallas 1, Texas

Cylinder Oils

See also "Lubricating Oils"; "Diesel Engine Lubricating Oils"; etc.
PHILLIPS PETROLEUM CORPORATION
Bartlesville, Oklahoma

Cylinder Repairs

ARTHUR TICKLE ENGINEERING WORKS
21 Delevan St.
Brooklyn 31, N. Y.
WASHINGTON IRON WORKS
Sherman, Texas

Cylinder Sleeves

SEALED POWER CORP.
500 Sanford Street
Muskegon 61, Michigan

De-Alkalizing Units, Water

ELGIN SOFTENER CORP.
133 North Grove Avenue
Elgin, Illinois

Dehydrators, Diesel Fuel

BOWSER, INC.
Fort Wayne 2, Indiana

De-Ionizing Units, Water

ELGIN SOFTENER CORP.
133 North Grove Avenue
Elgin, Illinois

Detergents

OAKITE PRODUCTS, INC.
19 Rector St.
New York 6, N. Y.
STANDARD OIL CO. (INDIANA)
910 So. Michigan Avenue
Chicago 80, Ill.

Detonation Indicator

ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Avenue
Chicago 40, Illinois

Development, Diesel Engine

LANOVA CORP.
38-15 30th Street
Long Island City 1, N. Y.

Dew Point Meter

ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle Street
Chicago 10, Illinois

Diesel Auxiliary Power Units, Marine

STERLING ENGINE COMPANY
1270 Niagara Street
Buffalo 13, N. Y.

Diesel Engine Cleaner (Parts)

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street
San Francisco 20, California

Diesel Engine Lubricating Oil

See also "Lubricating Oils"; "Cylinder Oil"
ASHLAND OIL & REFINING COMPANY
Ashland, Kentucky
PHILLIPS PETROLEUM CORPORATION
Bartlesville, Oklahoma
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, New York
STANDARD OIL CO. OF CALIFORNIA
225 Bush Street
San Francisco, Calif.
THE TEXAS COMPANY
135 East 42nd Street
New York 17, N. Y.

Diesel Engines For Shovels, Cranes & Dredges

STERLING ENGINE COMPANY
1270 Niagara Street
Buffalo 13, N. Y.

Diesel Engines, Reconditioned

See also "Diesel Repairs" and "Repairs Diesel".
AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York
BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.
GRIFFIN EQUIPMENT CORP.
880 E. 141 Street
New York, New York
A. G. SCHOONMAKER CO., INC.
50 Church Street
New York 7, N. Y.
THE UNION DIESEL ENGINE COMPANY
2121 Diesel Street
Oakland 6, California
WASHINGTON IRON WORKS
Sherman, Texas

Diesel Fork Lift Trucks

THE BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois

Diesel Fuel Oil

See also "Automotive Diesel Fuel"; "Fuel Oil, Diesel"; "Oils, Diesel Fuel"; "Motor Fuels".
ASHLAND OIL & REFINING COMPANY
Ashland, Kentucky
PHILLIPS PETROLEUM CORPORATION
Bartlesville, Oklahoma
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, New York
SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.
STANDARD OIL CO. OF CALIF.
225 Bush Street
San Francisco 20, Calif.
SUN OIL COMPANY
1608 Walnut Street
Philadelphia 3, Pennsylvania

TEXAS COMPANY
135 East 42nd Street
New York 17, New York
TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, New York

Diesel Generating Sets

See also "Auxiliary Diesel Generating Sets"; "Emergency Diesel Generators"; "Emergency Lighting Plants"; "Packaged Generators".

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio
BOLINDER COMPANY, INC.
33 Rector Street
CHICAGO PNEUMATIC TOOL COMPANY
6 East 44 Street
New York, New York
CUMMINS ENGINE CO., INC.
Columbus, Indiana
DETROIT DIESEL ENGINE DIV.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Mich.
ENTERPRISE ENGINE & MACH. CO.
18th & Florida Streets
San Francisco 10, Calif.
GRIFFIN EQUIPMENT CORP.
880 E. 141 Street
New York, New York
THE NATIONAL SUPPLY COMPANY
ENGINE DIVISION
1401 Sheridan Avenue
Springfield, Ohio
NORDBERG MANUFACTURING CO.
3073 South Chase Avenue
Milwaukee 1, Wisconsin
THE READY-POWER COMPANY
11231 Freud Avenue
Detroit 14, Michigan
A. G. SCHOONMAKER CO., INC.
50 Church Street
New York 7, N. Y.
STERLING ENGINE CO.
1270 Niagara Street
Buffalo 13, N. Y.
UNION DIESEL ENGINE COMPANY
2121 Diesel Street
Oakland 6, California

Diesel Generating Sets, Automatic Installation

STERLING ENGINE COMPANY
1270 Niagara Street
Buffalo 13, New York

Diesel Generator Sets, Portable

A. G. SCHOONMAKER CO., INC.
50 Church Avenue
New York 7, N. Y.
STERLING ENGINE COMPANY
1270 Niagara Street
Buffalo 13, N. Y.

Diesel Industrial Tractors

THE BUDA COMPANY
154th & Cemmercial Avenues
Harvey, Illinois

Diesel Locomotives

See also headings under "Locomotives".

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS CORP.
La Grange, Illinois

Diesel Locomotives, Elec. & Mech. Drives

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York
GENERAL ELECTRIC COMPANY
1 River Road
Schenectady, New York
STERLING ENGINE COMPANY
1270 Niagara Street
Buffalo 13, N. Y.

Diesel Nozzle Testers

See also "Nozzle Testers".

AUTOMOTIVE PRODUCTS, INC.
1700 S. E. Grand Avenue
Portland 14, Oregon
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Ave.
Pittsburgh 8, Pa.
C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Ave.
Cleveland 7, Ohio
KENT MOORE ORGANIZATION INC.
5-105 General Motors Building
Detroit, Michigan
MERLIN ENGINEERING CO., LTD.
Hobble Hills
Salterhebble, Halifax
Yorks, England

Diesel Power Units

BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois
CUMMINS ENGINE CO., INC.
Columbus, Indiana
HERCULES MOTOR CORP.
11th & Market S E
Canton 2, Ohio
THE NATIONAL SUPPLY COMPANY
ENGINE DIVISION
1401 Sheridan Avenue
Springfield, Ohio
NORDBERG MANUFACTURING COMPANY
3073 S. Chase Avenue
Milwaukee 1, Wisconsin
RATHBUN-JONES ENGINEERING COMPANY
Toledo 1, Ohio
A. G. SCHOONMAKER CO., INC.
50 Church Street
New York 7, N. Y.

Diesel Pumping Units

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Streets
San Francisco 10, California
NORDBERG MANUFACTURING CO.
3073 S. Chase Avenue
Milwaukee 1, Wisconsin
THE NATIONAL SUPPLY COMPANY
ENGINE DIVISION
1401 Sheridan Avenue
Springfield, Ohio
STERLING ENGINE COMPANY
1270 Niagara Street
Buffalo 13, N. Y.

Diesel Railway Generating Sets

THE NATIONAL SUPPLY COMPANY
ENGINE DIVISION
1401 Sheridan Avenue
Springfield, Ohio
STERLING ENGINE COMPANY
1270 Niagara Street
Buffalo 13, N. Y.
WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisc.

Diesel Repairs

See also "Diesel Engines, Reconditioned". "Repairs Diesel"

SIGURD GOLTEN MACHINE CORP.
455 Carroll Street
Brooklyn 15, N. Y.

Diesel Schools

UTILITIES ENGINEERING INSTITUTE
DIESEL DIVISION
2521 Sheffield Avenue
Chicago 14, Ill.

Diesel Starting Fluid

SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York, New York

Diesel Testing Equipment

AUTOMOTIVE PRODUCTS, INC.
1700 Southeast Grand Ave.
Portland 14, Oregon
BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Penna.
DIESEL PLANT SPECIALTIES CO.
424 Portage Aveune
Stevens Point, Wisconsin
EATON MANUFACTURING COMPANY
739 East 140th Street
Cleveland 10, Ohio
ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Avenue
Chicago 40, Illinois
KIENE DIESEL ACCESSORIES INC.
10352 Pacific Avenue
Franklin Park, Illinois
MERLIN ENGINEERING COMPANY, LTD.
Hobble Hills
Salterhebble, Halifax
Yorks, England

Drills, Portable Electric

SNAP-ON TOOLS CORP.
8064 28th Avenue
Kenosha, Wisconsin

Drives, Adjustable Speed

RELIANCE ELECTRIC & ENGINEERING COMPANY
1058 Ivanhoe Road
Cleveland 10, Ohio

Drives, Chain

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana
MORSE CHAIN COMPANY
7601 Central
Detroit 10, Michigan

Drives, Gearmotor

FOOTE BROS. GEAR & MACHINE CORP.
4545 Southwestern Boulevard
Chicago, Illinois

Drives, V-Belt

WORTHINGTON CORPORATION
Harrison, New Jersey

Dual Chain Engine Drives

MORSE CHAIN COMPANY
7601 Central Avenue
Detroit, Michigan

Dynamometers and Prony Brakes

EATON MANUFACTURING COMPANY
740 East 140th Street
Cleveland 10, Ohio
GENERAL ELECTRIC CO.
One River Road
Schenectady 5, N. Y.

Emergency Diesel Generators

See also "Auxiliary Diesel Generator Sets"; "Diesel Generating Sets"; "Emergency Lighting Plants"; "Packaged Generators".

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio
DETROIT DIESEL ENGINE DIV.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Mich.
THE READY-POWER COMPANY
11231 Freud Avenue
Detroit 14, Michigan

Emergency Lighting Plants

See also heading above.

GRIFFIN EQUIPMENT COMPANY
880 East 141 Street
New York 54, New York

ELECTRIC STORAGE BATTERY CO.
42 South 15 Street
Philadelphia 2, Pennsylvania

A. G. SCHOONMAKER CO., INC.
50 Church Street
New York 7, N. Y.

Engine Bases, Welded

GRAVER TANK & MFG. CO., INC.
East Chicago, Indiana

Engine Blocks, Welded

GRAVER TANK & MFG. CO., INC.
East Chicago, Indiana

Engine Cooling System Cleaners

See also "Exchangers, Heat Materials for for Cleaning"; "Scale Removal" Cleaning Compounds.

YOUNG RADIATOR COMPANY
Racine, Wisconsin

Engine Cooling System Rust Preventives

D. W. HAERING & CO., INC.
P. O. Box 6037
Harlandale Station
San Antonio 4, Texas

SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, N. Y.

SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.

YOUNG RADIATOR COMPANY
Racine, Wisconsin

Engines, Diesel, New

WAUKESHA MOTOR COMPANY
Waukesha, Wisconsin

Engines, Diesel, Used

BALDWIN-LIMA-HAMILTON CORPORATION
545 North 3rd Street
Hamilton, Ohio

A. G. SCHOONMAKER & CO., INC.
50 Church Street
New York 7, New York

WORTHINGTON CORPORATION
Harrison, New Jersey

Engine Repair Stands

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Bldg.
Detroit 2, Michigan

Engine Stands

CLEVELAND PNEUMATIC TOOL COMPANY
Automotive Division
3755 East 77th Street
Cleveland 5, Ohio

Equipment, Fuel Injection Nozzle and Needle Servicing

MERLIN ENGINEERING COMPANY, LTD.
Hobble Hills
Salterhebble, Halifax
Yorks, England

Evaporators

DAVIS ENGINEERING CORP.
1064 East Grand Street
Elizabeth 4, New Jersey

Evaporators, Exhaust Gas

DAVIS ENGINEERING CORP.
1064 East Grand Street
Elizabeth 4, New Jersey

Evaporators, Steam

DAVIS ENGINEERING CORP.
1064 East Grand Street
Elizabeth 4, New Jersey

MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Exchangers, Heat

See also "Water Cooling Equipment" and headings under "Coolers" and "Heat Exchangers".

AEROFIN CORP.
410 S. Geddes St.
Syracuse 1, N. Y.

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

DAVIS ENGINEERING CORP.
1064 East Grand Street
Elizabeth 4, New Jersey

HARRISON RADIATOR DIVISION
GENERAL MOTORS CORP.
Washburn Street
Lockport, New York

KEWANEE-ROSS CORPORATION
1405 West Avenue
Buffalo 13, N. Y.

THE SIMS COMPANY
1402 East 18th Street
Erie, Pennsylvania

WORTHINGTON CORPORATION
Harrison, New Jersey

Exchangers, Heat, Materials for Cleaning

See also headings under "Cleaner"; "Cooler"; "Cooling"; and "Engine"

D. W. HAERING & CO., INC.
P. O. Box 6037
Harlandale Station
San Antonio 4, Texas

OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.

Exciters

ELLIOTT COMPANY
Jeannette, Pennsylvania

Exhaust Flexible Hose

See also headings under "Flexible"; "Hose"; and "Tubing"

ALLIED METAL HOSE CO.
37-46 Ninth Street
Long Island City 1, N. Y.

DIESEL PLANT SPECIALTIES CO.
424 Portage Street
Stevens Point, Wisconsin

Exhaust Manifolds

See Also "Manifolds", etc.

FLORI PIPE COMPANY
629 East Red Bud Ave.
St. Louis, Missouri

Expansion Joints, Corrugated, Stainless Steel

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

FLEXONICS CORP.
1315 S. Third Ave.
Maywood, Illinois

Fans, Axial Flow

KOPPERS COMPANY, INC.
Koppers Building
Pittsburgh 19, Penna.

SCHWITZER-CUMMINS COMPANY
1125 Massachusetts Avenue
Indianapolis 7, Indiana

Fans, Centrifugal

SCHWITZER-CUMMINS COMPANY
1125 Massachusetts Avenue
Indianapolis 7, Indiana

THE TRANE COMPANY
LaCrosse, Wisconsin

Fans, Radiator Cooling

SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis 7, Indiana

Filtering Systems

See headings under "Filters"

BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.

COMMERCIAL FILTERS CORPORATION
18 West Third Street
Boston 27, Mass.

HONAN-CRANE CORPORATION
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana

WM. W. NUGENT & CO., INC.
410-412 North Hermitage Avenue
Chicago 22, Illinois

PUROLATOR PRODUCTS INC.
970 New Brunswick Avenue
Rahway, New Jersey

WINSLOW ENGINEERING COMPANY
4069-73 Hollis Street
Oakland 8, California

Filters, Air

See also "Air Cleaners"; "Air Filters", and Headings under "Breathers".

CONTINENTAL AIR FILTERS, INC.
2520 Helm Street
Louisville 1, Kentucky

Filters, Air, Automatic Self-Cleaned

AMERICAN AIR FILTER CO., INC.
445 Central Avenue
Louisville 8, Ky.

CONTINENTAL AIR FILTERS, INC.
2520 Helm Street
Louisville 1, Kentucky

CUNO ENGINEERING COMPANY
80 South Vine Street
Meriden, Connecticut

WINSLOW ENGINEERING COMPANY
4069-73 Hollis Street
Oakland 8, California

Filters, Air, Dry Type

AMERICAN AIR FILTER CO., INC.
445 Central Avenue
Louisville 8, Ky.

WINSLOW ENGINEERING COMPANY
4069-73 Hollis Street
Oakland 8, California

Filters, Air, Dry Type (Crankcase)

FRAM CORP.
Providence 16, Rhode Island

Filters, Air, Materials for Cleaning

AMERICAN AIR FILTER CO., INC.
445 Central Avenue
Louisville 8, Ky.

Filters, Air, Oil Bath Type

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

AMERICAN AIR FILTER CO., INC.
445 Central Avenue
Louisville 8, Ky.

DONALDSON COMPANY, INC.
666 Pelham Blvd.
St. Paul 4, Minnesota

VORTOX COMPANY
121 South Alexander
Claremont, California

Filters, Air, Open-Screen Type

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

Filters, Air, Panel Type

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio
AMERICAN AIR FILTER CO., INC.
445 Central Avenue
Louisville 8, Ky.
VORTOX COMPANY
121 South Alexander
Claremont, California

Filters (Centrifugal) Lubricating Oil

THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.

Filters, Compressed Air

AMERICAN AIR FILTER CO., INC.
445 Central Avenue
Louisville 8, Kentucky
BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
COMMERCIAL FILTERS CORP.
18 West Third Street
Boston 27, Massachusetts
CUNO ENGINEERING CORP.
80 South Vine Street,
Meriden, Connecticut
WINSLOW ENGINEERING COMPANY
4069-73 Hollis Street
Oakland 8, California

Filters, 5-Micron, Diesel Fuel

BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
C. A. V. DIVISION OF LUCAS
ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
COMMERCIAL FILTERS CORPORATION
18 West Third Street
Boston 27, Mass.
CUNO ENGINEERING COMPANY
80 South Vine Street
Meriden, Connecticut
HONAN-CRANE CORPORATION
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana
WM. W. NUGENT & COMPANY, INC.
410-412 North Hermitage Avenue
Chicago 22, Illinois
PUROLATOR PRODUCTS, INC.
970 New Brunswick Avenue
Rahway, New Jersey

Filters, Fuel Oil

See also "Oil Filters".
AMERICAN BOSCH CORP.
3664 Main Street
Springfield 7, Mass.
BOWSER, INC.
Fort Wayne 2, Indiana
BRIGGS FILTRATION COMPANY
River Road
Washington 16, D. C.
C. A. V., DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
COMMERCIAL FILTERS CORP.
18 West Third Street
Boston 27, Mass.
CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Conn.
DIESEL INJECTION SALES & SERVICE
808 Union Street
Norfolk, Virginia
FRAM CORP.
Providence 16, Rhode Island
THE HILLIARD CORP.
120 West 4th Street
Elmira, N. Y.
HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Ave.
Lebanon, Indiana
LUBER-FINER, INC.
2514 South Grand Avenue
Los Angeles, California
WILLIAM W. NUGENT & CO., INC.
410 No. Hermitage Ave.
Chicago 22, Ill.
PUROLATOR PRODUCTS, INC.
970 New Brunswick Ave.
Rahway, N. J.
U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
Thompson Road
Syracuse 6, N. Y.
E. A. WILDERMUTH INC.
1102 Atlantic Ave.
Brooklyn 16, N. Y.
WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.
WIX ACCESSORIES CORP.
Ozark Avenue
Gastonia, North Carolina

Filters, Gasoline

BOWSER, INC.
Fort Wayne 2, Indiana
BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
COMMERCIAL FILTERS CORP.
18 West Third Street
Boston 27, Massachusetts
CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Connecticut
FRAM CORP.
Providence 16, R. I.
HILLIARD CORP.
120 West 4th St.
Elmira, N. Y.

Filters, Lubricating Oil

See also "Oil Filters".
AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio.
BOWSER, INC.
Fort Wayne 2, Indiana
BRIGGS FILTRATION COMPANY
River Road
Washington 16, D. C.
COMMERCIAL FILTERS CORP.
18 West Third Street
Boston 27, Mass.
DIESEL INJECTION SALES & SERVICE
808 Union Street
Norfolk, Virginia
DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin
FRAM CORP.
Providence 16, Rhode Island
THE HILLIARD CORP.
120 West 4th Street
Elmira, N. Y.
HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana
LUBER-FINER, INC.
2514 South Grand Avenue
Los Angeles, California
WILLIAM W. NUGENT & CO., INC.
410 N. Hermitage Ave.
Chicago 22, Ill.
PUROLATOR PRODUCTS, INC.
970 New Brunswick Ave.
Rahway, N. J.
U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
Thompson Road
Syracuse 6, N. Y.
WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.
WIX ACCESSORIES CORP.
Ozark Avenue
Gastonia, North Carolina

Filters, Lubricating Oil, Magnetic

CUNO ENGINEERING COMPANY
80 South Vine Street
Meriden, Connecticut
HONAN-CRANE CORPORATION
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana
WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.

Filter-Silencer, Oil Bath Type

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio.

Fire Extinguishing Systems—Carbon Dioxide Hose Reels & Built-in Systems

WALTER KIDDE & COMPANY, INC.
YOUNGSTOWN MILLER DIVISION
373 Main Street
Belleville 9, New Jersey

Fire Extinguishers—Dry Chemical & Carbon Dioxide

WALTER KIDDE & COMPANY, INC.
YOUNGSTOWN MILLER DIVISION
373 Main Street
Belleville 9, New Jersey

Fittings, Flare

THE WEATHERHEAD COMPANY
300 East 131 Street
Cleveland 8, Ohio

Fittings, Hose, Detachable

AERO-COUPLING CORPORATION
3015 Winona Avenue
Burbank, California
AEROQUIP CORP.
Jackson, Michigan
DIESEL INJECTION SALES & SERVICE
808 Union Street
Norfolk, Virginia
STRATOFLEX, INC.
220 Roberts Cut-Off
Fort Worth, Texas
THE WEATHERHEAD COMPANY
300 East 131 Street
Cleveland 8, Ohio

Fittings, Tube

THE WEATHERHEAD COMPANY
300 East 131 Street
Cleveland 8, Ohio

Flexible Connections, Stainless Steel

See also headings under "Hose" and "Tubing".
ALLIED METAL HOSE COMPANY
37-46 Ninth Street
Long Island City 1, New York
AMERICAN BRASS COMPANY
AMERICAN METAL HOSE BRANCH
Waterbury 20, Connecticut
ATLANTIC METAL HOSE CO. INC.
123 W. 64th St.
New York 23, N. Y.
PENN. FLEXIBLE METALLIC TUBING COMPANY
7271 Powers Lane
Philadelphia 42, Pennsylvania

Flexible Corrugated Metal Hose

ALLIED METAL HOSE COMPANY
37-46 Ninth Street
Long Island City 1, New York

Flexible Exhaust Connections

See also headings under "Hose" and "Tubing".
ALLIED METAL HOSE COMPANY
37-46 Ninth Street
Long Island City 1, New York
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.

ATLANTIC METAL HOSE CO., INC.
123 West 64th Street
New York 23, N. Y.
FLEXONICS CORP.
1315 So. 3rd Ave.
Maywood, Ill.
PENN. FLEXIBLE METALLIC TUBING COMPANY
7271 Powers Lane
Philadelphia 42, Pennsylvania

Flexible Metal Hose

See also "Hose, Flexible, Metallic".

AERO-COUPLING CORPORATION
3015 Winona Avenue
Burbank, California
AEROQUIP CORP.
Jackson, Michigan
AMERICAN BRASS COMPANY
American Metal Hose Branch
Waterbury 20, Connecticut
FLEXONICS CORPORATION
1315 South 3rd Avenue
Maywood, Illinois

Flexible Metal Hose, Fuel Oil, Lubricating Oil, Compressed Air

See also headings under "Hose" and "Tubing".

AERO-COUPLING CORPORATION
3015 Winona Avenue
Burbank, California
AEROQUIP CORPORATION
Jackson, Michigan
ALLIED METAL HOSE COMPANY
37—46 Ninth Street
Long Island City 1, New York
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.
PENNSYLVANIA FLEXIBLE METALLIC TUBING CO.
7217 Power Lane
Philadelphia, Pennsylvania

Flexible Metal Hose, Fuel Oil, Lubricating Oil, Compressed Air & Water

See also headings under "Hose" and "Tubing"

AERO-COUPLING CORPORATION
3015 Winona Avenue
Burbank, California
AEROQUIP CORPORATION
Jackson, Michigan
AMERICAN BRASS COMPANY
American Metal Hose Branch
Waterbury 20, Connecticut
DIESEL INJECTION SALES & SERVICE
808 Union Street
Norfolk, Virgina

Flexible Metal Hose, Fuel Oil, Lubricating Oil, Compressed Air, Water, Steam, etc.

ATLANTIC METAL HOSE COMPANY
123 West 64 Street
New York 23, New York
FLEXONICS CORPORATION
1315 South 3rd Avenue
Maywood, Illinois

Forgings, Aluminum

WYMAN-GORDON COMPANY
GENERAL OFFICE & WORKS, Worcester 1, Mass.
(INGALLS-SHEPARD DIVISION, Harvey, Ill.)
(GRAFTON DIVISION, N. Grafton, Mass.)

Forgings, Drop

INDIANAPOLIS DROP FORGING CO.
1300 Madison Avenue
Indianapolis, Indiana
TITUSVILLE FORGE DIVISION
STRUTHERS WELLS CORPORATION
Titusville, Pennsylvania
WYMAN-GORDON COMPANY
GENERAL OFFICE & WORKS, Worcester 1, Mass.
(INGALLS-SHEPARD DIVISION, Harvey, Ill.)
(GRAFTON DIVISION, N. Grafton, Mass.)

Forgings, Steel Carbon & Alloy

ERIE, FORGE & STEEL CORPORATION
15th & Cascade Streets
Erie, Pennsylvania

Forgings, Steel & Iron

ELLWOOD CITY FORGE CO.
Ellwood City, Pa.
INDIANAPOLIS DROP FORGING COMPANY
1300 Madison Avenue
Indianapolis, Indiana
TITUSVILLE FORGE DIVISION
STRUTHERS WELLS CORPORATON
Titusville, Pennsylvania
WYMAN-GORDON COMPANY
GENERAL OFFICE & WORKS, Worcester 1, Mass.
(INGALLS-SHEPARD DIVISION, Harvey, Ill.)
(GRAFTON DIVISION, N. Grafton, Mass.)

Fuel Injection Systems, Repair & Service

See also "Injection Systems, Service"; "Service, Injection System".

DIESEL INJECTION SALES & SERVICE
808 Union Street
Norfolk, Virginia
KOEPSEL & LOVE, INC.
47 East Seventh Street, South
Salt Lake City 2, Utah
MERLIN ENGINEERING COMPANY, LTD.
Hobble Hills
Salterhebble, Halifax
Yorks, England

Fuel Injection Tubing

AMERICAN BRASS COMPANY
AMERICAN METAL HOSE BRANCH
Waterbury 20, Connecticut

Fuel Injectors, Rebuilding

See also headings above.

AMERICAN DIESEL SERVICE
3497 West 140 Street
Cleveland 11, Ohio

Fuel Oil Additives

See also "Additives"; "Fuel Oil Treatment".

DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin

Fuel Oil, Diesel

See also "Automotive Diesel Fuel"; "Oils, Diesel Fuels"; "Diesel Fuel Oil".

ASHLAND OIL & REFINING CO.
Ashland, Kentucky
CITIES SERVICE OIL CO.
Sixty Wall Tower
New York 5, N. Y.
GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Building
Pittsburgh 30, Pa.
MID-CONTINENT PETROLEUM CORP.
Tulsa 2, Okla.
PHILLIPS PETROLEUM CORPORATION
Bartlesville, Oklahoma
PURE OIL COMPANY
35 East Wacker Drive
Chicago, Illinois
SINCLAIR REFINING CO.
600 Fifth Avenue
New York 20, N. Y.
STANDARD OIL CO. (Indiana)
910 South Michigan Ave.
Chicago 80, Illinois
SUN OIL COMPANY
1608 Walnut Street
Philadelphia, Pennsylvania
THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

Fuel Oil Heaters, Diesel

DAVIS ENGINEERING CORPORATION
1064 East Grand Street
Elizabeth 4, New Jersey
KEWANEE-ROSS CORPORATION
1405 West Avenue
Buffalo 13, New York

Fuel Transfer Pumps Rebuilding

See also "Fuel Injection Systems".

AMERICAN DIESEL SERVICE
3497 West 140 Street
Cleveland 11, Ohio

Gages, Air Pressure

ROCHESTER MFG. CO., INC.
101 Rockwood St.
Rochester 10, N. Y.
WEKSLER THERMOMETER CORPORATION
Martinique Building
49 West 32 Street
New York, New York

Gages, Draft, Portable Indicating

BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Pa.

Gages, Fuel

THE LIQUIDOMETER CORP.
36-24 Skillman Avenue
Long Island City 1, N. Y.
ROCHESTER MFG. CO., INC.
101 Rockwood St.
Rochester 10, N. Y.

Gages, Oil Pressure

ROCHESTER MFG. CO., INC.
101 Rockwood St.
Rochester 10, N. Y.
WEKSLER THERMOMETER CORPORATION
Martinique Building
49 West 32 Street
New York, New York

Gages, Tank Contents

DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin
THE LIQUIDOMETER CORP.
36-24 Skillman Avenue
Long Island City 1, N. Y.
VIKING PUMP COMPANY
Cedar Falls, Iowa

Gages Temperature

ROCHESTER MFG. CO., INC.
101 Rockwood St.
Rochester 10, N. Y.
WEKSLER THERMOMETER CORPORATION
Martinique Building
49 West 32 Street
New York, New York

Gages, Vacuum

ROCHESTER MFG. CO., INC.
101 Rockwood St.
Rochester, N Y.
WEKSLER THERMOMETER CORPORATION
Martinique Building
49 West 32 Street
New York, New York

Gaskets

THE FITZGERALD MFG. CO.
Torrington, Conn.

Gaskets, Asbestos

THE FITZGERALD MFG. CO.
Torrington, Conn.

VICTOR MANUFACTURING & GASKET COMPANY
5750 Roosevelt Avenue
Chicago, Illinois

Gaskets, Cork

THE FITZGERALD MFG. CO.
Torrington, Conn.

Gaskets, Fibrous

THE FITZGERALD MFG. CO.
Torrington, Conn.

Gaskets, Metallic

THE FITZGERALD MFG. CO.
Torrington, Conn.
VICTOR MANUFACTURING & GASKET COMPANY
5750 Roosevelt Avenue
Chicago, Illinois

Gaskets, Oil and Water

THE FITZGERALD MFG. CO.
Torrington, Conn.
VICTOR MANUFACTURING & GASKET COMPANY
5750 Roosevelt Avenue
Chicago, Illinois

Gearmotors

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois
FOOTE BROS. GEAR & MACHINE CORP.
4545 Southwestern Boulevard
Chicago, Illinois

Gear Lubricants

TIDE WATER ASSOCIATED OIL COMPANY
17 Battery Place
New York, New York

Gears, Cut

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero, Illinois
FOOTE BROS. GEAR & MACHINE CORP.
4545 Southwestern Boulevard
Chicago, Illinois

Gears, Reduction

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero, Illinois
FOOTE BROS. GEAR & MACHINE CORP.
4545 Southwestern Boulevard
Chicago, Illinois
ROCKFORD CLUTCH DIVISION
BORG-WARNER CORP.
1301 18th Avenue
Rockford, Illinois
THE SNOW-NABSTEDT GEAR CORP.
251 Welton Street
Hamden, Conn.

Generating Sets, Electric

See also "Diesel Generator Sets"; "Auxiliary Diesel Generating Sets"; "Emergency Diesel Generators"; "Emergency Lighting Plants"; "Packaged Generators".

BOLINDER COMPANY, INC.
33 Rector Street
New York, New York
THE BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois
CHICAGO PNEUMATIC TOOL COMPANY
6 East 44 Street
New York, New York
CLEVELAND DIESEL ENGINE DIV.
GENERAL MOTORS CORPORATION
2160 W. 106th Street
Cleveland, Ohio
DETROIT DIESEL ENGINE DIV.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Mich.
IDEAL ELECTRIC & MANUFACTURING CO.
Mansfield, Ohio
THE READY-POWER COMPANY
11231 Freud Avenue
Detroit 14, Michigan
A. G. SCHOONMAKER COMPANY, INC.
50 Church Street
New York, New York

Generators, A. C.

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave.
Cleveland 14, Ohio
DELCO PRODUCTS DIVN.
GENERAL MOTORS CORP.
329 E. First St.
Dayton 1, Ohio
ELECTRIC MACHINERY MFG. CO.
1331 Tyler St., N.E.
Minneapolis 13, Minn.
ELLIOTT COMPANY
Jeanette, Pennsylvania
IDEAL ELECTRIC & MANUFACTURING CO.
Mansfield, Ohio
KURZ & ROOT, INC.
236 North Island Street
Appleton, Wisconsin
MARATHON ELECTRIC & MFG. CO.
Wausau, Wisconsin

Generators, Charging

AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield, Massachusets
DELCO-REMY DIV.
GENERAL MOTORS CORP.
2401 Columbus Avenue
Anderson, Indiana
KURZ & ROOT, INC.
236 North Island Street
Appleton, Wisconsin
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Generators, Charging, Rectified A.C.

DELCO-REMY DIVISION
GENERAL MOTORS CORPORATON
2401 Columbus Avenue
Anderson, Indiana
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Generators, D. C.

C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Avenue
Cleveland 14, Ohio
DELCO PRODUCTS DIVISION
GENERAL MOTORS CORPORATION
329 E. First Street
Dayton 1, Ohio
THE ELLIOTT COMPANY
Jeanette, Pennsylvania
IDEAL ELECTRIC & MFG. COMPANY
Mansfield, Ohio
KURZ & ROOT, INC.
236 North Island Street
Appleton, Wisconsin
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland, Ohio
MARATHON ELECTRIC & MFG. COMPANY
Wausau, Wisconsin
MARINE & COMMERCIAL DIVISION
SAFETY CAR HEATING & LIGHTING COMPANY, INC.
P. O. Box 904
New Haven, Connecticut
RELIANCE ELECTRIC & ENGINEERING CO.
1058 Ivanhoe Road
Cleveland 10, Ohio
A. G. SCHOONMAKER CO., INC.
50 Church Street
New York, New York

Generators, Engine Driven

BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois
DELCO PRODUCTS DIVN.
329 E. First Street
Dayton 1, Ohio
DETROIT DIESEL ENGINE DIV.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Mich.
ELECTRIC MACHINERY MFG. CO.
1331 Tyler Street, N. E.
Minneapolis 13, Minn.
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.
IDEAL ELECTRIC & MANUFACTURING COMPANY
Mansfield, Ohio
KURZ & ROOT, INC.
236 North Island Street
Appleton, Wisconsin
THE READY-POWER COMPANY
11231 Freud Avenue
Detroit 14, Michigan
A. G. SCHOONMAKER CO., INC.
50 Church Street
New York 7, N. Y.
UNION DIESEL ENGINE COMPANY
2121 Diesel Street
Oakland 6, California

Governors, Centrifugal

PICKERING GOVERNOR CO.
Paramus, New Jersey

Governors, Hydraulic

DIESEL INJECTION SALES & SERVICE
808 Union Street
Norfolk, Virginia
PICKERING GOVERNOR CO.
Paramus, New Jersey
PIERCE GOVERNOR CO.
1625 Ohio Ave.
Anderson, Indiana
WOODWARD GOVERNOR CO.
5001 N. Second St.
Rockford, Illinois

Governors, Overspeed

PIERCE GOVERNOR COMPANY
1625 Ohio Avenue
Anderson, Indiana
SYNCHRO-START PRODUCTS INC.
8151 North Ridgeway Avenue
Skokie, Illinois
WOODWARD GOVERNOR CO.
5001 N. Second St.
Rockford, Illinois

Governors, Overspeed, Engine Shut-Off

PICKERING GOVERNOR CO.
Paramus, New Jersey
PIERCE GOVERNOR CO.
1625 Ohio Ave.
Anderson, Indiana
SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Ave.
Skokie, Ill.

Graphite, Colloidal

ACHESON COLLOIDS COMPANY
1645 Washington Avenue
Port Huron, Michigan

Graphite, Wheel Flange Lubrication Rods

NATIONAL CARBON COMPANY
DIVISION OF UNION CARBIDE & CARBON CORP.
30 E. 42 Street
New York, New York

Greases

See also "Lubricants"; "Automotive Greases".

CITIES SERVICE OIL CO.
Sixty Wall Tower
New York 5, N. Y.
GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Bldg.
Pittsburgh 30, Pa.
PHILLIPS PETROLEUM CORP.
Bartlesville, Oklahoma
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.
THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

Greases, Automotive

MID-CONTINENT PETROLEUM CORP.
Box 381
Tulsa 2, Oklahoma

Greases, Industrial

MID-CONTINENT PETROLEUM CORP.
Box 381
Tulsa 2, Oklahoma

Grey Iron and Steel Castings

EATON MANUFACTURING COMPANY
740 East 140th Street
Cleveland 10, Ohio

Grinders, Cylinder Head

VAN NORMAN CO.
AUTOMOTIVE DIVISION
Springfield 7, Mass.

Grinders, Surface, Cylinder Head & Block

LEMPCO PRODUCTS
Dunham Road
Bedford, Ohio

Gun Greases

TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York, New York

Heat Exchangers

YOUNG RADIATOR COMPANY
Racine, Wisconsin

Heat Exchangers, Air Cooled

AEROFIN CORPORATION
410 S. Geddes Street
Syracuse 4, N. Y.
AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York
HARRISON RADIATOR DIVISION
GENERAL MOTORS CORP.
Washburn Street
Lockport 10, N. Y.
THE MARLEY COMPANY
222 West Gregory Blvd.
Kansas City 5, Missouri
J. F. PRITCHARD & CO.
210 W. 10 St.
Kansas City 5, Missouri
THE TRANE CO.
La Crosse, Wisconsin

Heat Exchangers, Industrial

AEROFIN CORPORATION
410 South Geddes Street
Syracuse 4, New York
AMERICAN LOCOMOTIVE COMPANY
Schenectady 5, N. Y.
DAVIS ENGINEERING CORPORATION
1064 E. Grand Street
Elizabeth, New Jersey
HARRISON RADIATOR DIVISION
GENERAL MOTORS CORPORATION
Washburn Street
Lockport, New York
KEWANEE-ROSS CORPORATION
1405 West Avenue
Buffalo 13, New York
THE TRANE COMPANY
La Crosse, Wisconsin
YOUNG RADIATOR COMPANY
Racine, Wisconsin

Heat Exchangers, Oil and Water Cooling

See also headings under "Coolers"; "Exchangers, Heat"; "Water Cooling Equipment"; etc.

AEROFIN CORPORATION
410 S. Geddes Street
Syracuse 4, N. Y.
AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York
BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.
DAVIS ENGINEERING CORP.
1064 East Grand Street
Elizabeth, New Jersey
HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, N. Y.
KEWANEE-ROSS CORPORATION
1405 West Avenue
Buffalo 13, New York
THE SIMS COMPANY
1402 E. 18th St.
Erie, Pa.
THE TRANE CO.
La Crosse, Wisconsin
UNION DIESEL ENGINE COMPANY
2121 Diesel Street
Oakland 6, Calif.
HENRY VOGT MACHINE CO.
1000 West Ormsby St.
Louisville 10, Ky.
YOUNG RADIATOR CO.
Racine, Wisconsin

Heat Treating Equipment, Induction

OHIO CRANKSHAFT
3800 Harvard Ave.
Cleveland 5, Ohio

Heaters

PICKERING GOVERNOR
Paramus, New Jersey

Heaters, Feedwater

AMERICAN LOCOMOTIVE CO.
Schenectady, N. Y.
DAVIS ENGINEERING CORPORATION
1064 E. Grand Street
Elizabeth, New Jersey
KEWANEE-ROSS CORPORATION
1405 West Avenue
Buffalo 13, N. Y.

Heavy Duty Lubricants

MID-CONTINENT PETROLEUM CORP.
Box 381
Tulsa 2, Oklahoma

High Temperature Grease

TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York, New York

Hose and Hose Assemblies, Non-Metallic

AERO-COUPLING CORP.
3015 Winona Ave.
Burbank, California
AEROQUIP CORPORATION
Jackson, Michigan
AMERICAN VENTILATING HOSE CO.
DIVISION OF CALLAHAN ZINC-LEAD CO., INC.
100 Park Ave.
New York 17, N. Y.
THE WEATHERHEAD COMPANY
300 East 131 Street
Cleveland 8, Ohio

Hose, Flexible Assemblies

See also headings under "Flexible" and "Tubing".

AERO-COUPLING CORP.
3015 Winona Ave.
Burbank, California
AEROQUIP CORP.
Jackson, Michigan
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.
DIESEL INJECTION SALES & SERVICE
808 Union Street
Norfolk, Virginia
STRATOFLEX INC.
220 Roberts Cut-Off
Ft. Worth, Texas
THE WEATHERHEAD COMPANY
300 East 131 Street
Cleveland 8, Ohio

Hose, Flexible Metallic

See also headings under "Flexible" and "Tubing".

AERO-COUPLING CORP.
3015 Winona Ave.
Burbank, California
AEROQUIP CORP.
Jackson, Michigan
ALLIED METAL HOSE COMPANY
37-46 Ninth Street
Long Island City 1, New York
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO. INC.
123 W. 64th St.
New York 23, N. Y.
FLEXONICS CORPORATION
1315 South 3rd Avenue
Maywood, Illinois

Hoses, Flexible Wire Braid

AERO-COUPLING CORP.
3015 Winona Ave.
Burbank, California
AEROQUIP CORPORATION
Jackson, Michigan
AMERICAN BRASS COMPANY
AMERICAN METAL HOSE BRANCH
Waterbury 20, Connecticut
ATLANTIC METAL HOSE COMPANY INC.
123 W. 64 Street
New York 23, New York
STRATOFLEX INC.
220 Roberts Cut-Off
Ft. Worth, Texas
THE WEATHERHEAD COMPANY
300 East 131 Street
Cleveland 8, Ohio

Hose, Metal For Steam, Oil, Compressed Air

See also headings under "Flexible Hose" and "Tubing".

ALLIED METAL HOSE COMPANY
37-46 Ninth Street
Long Island City 1, New York
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.

Hy-Vo Drives

MORSE CHAIN COMPANY
7601 Central Ave.
Detroit, Michigan

Hydraulic Fluids

PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois

Hydraulic, Governors

See also Governors, Hydraulic and Overspeed

WOODWARD GOVERNOR CO.
5001 North 2nd Street
Rockford, Illinois

Hydraulic Oils

TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York, New York

Ignition Systems, Gas Engine

AMERICAN BOSCH CORPORATION
3664, Main Sreet
Springfield 7, Mass.

SCINTILLA MAGNETO DIVISION
Bendix Aviation Corp.
Sidney, New York

Ignition Transformers

AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield 7, Mass.

Ingots & Billets

ERIE FORGE & STEEL CORP.
15 & Cascade Streets
Erie, Pennsylvania

Impact Wrenches

INGERSOLL-RAND COMPANY
11 Broadway
New York 4, New York

Indicator Valves

KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Avenue
Franklin Park, Illinois

Indicators, Carbon Dioxide Portable

BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Ave.
Pittsburgh 8, Pa.

Indicators, Diesel Engine

See also "Compression Testers, Diesel Engine", and other headings under "Indicators".

BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Ave.
Pittsburgh 8, Pa.

ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Ave.
Chicago 40, Illinois

KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Ave.
Franklin Park, Illinois

Indicators, Oxygen, Portable

BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Ave.
Pittsburgh 8, Pa.

Indicators, Pressure-Time, Diesel Engine

BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Bennett St.
Pittsburgh 8, Pa.

ELECTRO PRODUCTS LABORATORIES, INC.
4501 No. Ravenswood Ave.
Chicago 40, Illinois

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Indicators, Sight Flow

BOWSER, INC.
Fort Wayne 2, Indiana

WILLIAM W. NUGENT & CO.
410 N. Hermitage Ave.
Chicago 22, Ill.

Indicators, Speed

BROWN & SHARPE MANUFACTURING CO.
Providence 1, Rhode Island

HERMAN H. STICHT COMPANY, INC.
27 Park Place
New York, New York

Indicators, Speed, Electric

WESTON ELECTRICAL INSTRUMENT CORP.
614 Frelinghuysen Ave.
Newark, New Jersey

Induction Heating Equipment

OHIO CRANKSHAFT COMPANY
3800 Harvard Avenue
Cleveland 5, Ohio

Industrial Flashlights & Batteries

NATIONAL CARBON CO.
DIVISION OF UNION CARBIDE & CARBON CORP.
30 E. 42 Street
New York, New York

Industrial Pumping & Power Units

See also Pumping units

CLEVELAND DIESEL ENGINE DIV.
GENERAL MOTORS, CORP.
2160 West 106th Street
Cleveland 11, Ohio

Industrial Oils

See also headings under "Lubricants" and "Greases".

PHILLIPS PETROLEUM CORP.
Bartlesville, Oklahoma

SUN OIL COMPANY
1608 Walnut Street
Philadelphia, Pennsylvania

Industrial Wheel Tractors

BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois

Injection Systems, Fuel

AMERICAN BOSCH CORP.
3664 Main St.
Springfield 7, Mass.

C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio

HARTFORD MACHINE SCREW COMPANY
Box 1440
Hartford, Connecticut

SCINTILLA MAGNETO DIVN.
BENDIX AVIATION CORP.
Sidney, N. Y.

UNEX PRODUCTS CORPORATION
30 Vesey Street
New York 7, New York

Injection Systems, Service

See also "Fuel Injection Systems, Repair & Service"; Service, Injection System".

DIESEL ENGINEERING MANUFACTURING COMPANY
200 North Laflin Street
Chicago 7, Illinois

DIESEL INJECTION SALES & SERVICE
808 Union Street
Norfolk, Virginia

GRIFFIN EQUIPMENT CORP.
880 E. 141 Street
New York, New York

SIGURD GOLTEN MACHINE CORP.
455 Carroll Street
Brooklyn 15, N. Y.

MERLIN ENGINEERING CO. LTD.
Hobble Hills
Salterbebble, Halifax
Yorks, England

E. A. WILDERMUTH
1102 Atlantic Avenue
Brooklyn 16, N. Y.

Injector Test Stand

See also "Nozzle Testers"

AUTOMOTIVE PRODUCTS, INC.
1700 Southeast Grand Ave.
Portland 14,, Oregon

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Injectors & Pump Exchange

AMERICAN DIESEL SERVICE
3497 W. 140th Street
Cleveland 11, Ohio

Inspection, Manufacture and Overhaul, for Defects

MAGNAFLUX CORP.
7300 W. Lawrence Ave.
Chicago 31, Illinois

SONOFLUX
6211 Edloe
Houston, Texas

Intake Silencers-Cleaners, Oil Bath Type

AMERICAN AIR FILTER COMPANY, INC.
445 Central Avenue
Louisville 7, Kentucky

Intake Silencers—Cleaners, Dry Type

See also "Silencers, Intake".

BURGESS-MANNING COMPANY
749 East Park Avenue
Libertyville, Illinois

Laboratory, Diesel Engine

LANOVA CORP.
38-15 30th St.
Long Island City 1, N. Y.

Lathes, Brakedrum

VAN NORMAN COMPANY
AUTOMOTIVE DIVISION
Springfield, Massachusetts

Lifts, Portable Hydraulic

LEMPCO PRODUCTS, INC.
Dunham Road
Bedford, Ohio

Liner Plating, Porous Chrome

SPAR-TAN ENGINEERING COMPANY
Western Licensee—Van der Horst Corp.
2445 Enterprise St.
Los Angeles 21, California

Liners, Diesel Cylinder

See also "Cylinder Liners."

HUNT-SPILLER MFG. CO.
383 Dorchester Ave.
Boston 27, Mass.

Lock Nuts

COLUMBIA NUT & BOLT CO., INC.
945 Main Street
Bridgeport 3, Conn.

Locomotives, Diesel

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

Locomotives, Diesel-Electric

See also heading under "Diesel Locomotives"

AMERICAN LOCOMOTIVE CO.
Schenectady 5, N. Y.

GENERAL ELECTRIC CO.
One River Road
Schenectady 5, N. Y.

Lubricants

See also "Industrial Oils", "Greases", "Industrial Greases"

ACHESON COLLOIDS COMPANY
1645 Washington Avenue
Port Huron, Michigan

ASHLAND OIL & REFINNG CO.
Ashland, Kentucky
GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Bldg.
Pittsburgh 30, Pa.
PHILLIPS PETROLEUM CORPORATION
Bartlesville, Oklahoma
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SINCLAIR REFINING CO.
600 Fifth Avenue
New York 20, N. Y.
TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, N. Y.

Lubricants, Diesel Engine

MID-CONTINENT PETROLEUM CORPORATION
Box 381
Tulsa 2, Oklahoma

Lubricating Compound

CITIES SERVICE OIL CO.
60 Wall Tower
New York 5, N. Y.

Lubricating Oil Compound

CITIES SERVICE OIL COMPANY
60 Wall Tower
New York, New York
STANDARD OIL CO. (INDIANA)
910 So. Michigan Avenue
Chicago 80, Ill.

Lubricating Oils

See also "Automotive Lubricating Oils"; "Oils Lubricating" and "Cylinder Oils".

ASHLAND OIL & REFINING CO.
Ashland, Kentucky
GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Bldg.
Pittsburgh 30, Pa.
PHILLIPS PETROLEUM CORPORATION
Bartlesville, Oklahoma
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SINCLAIR REFINING CO.
600 Fifth Ave.
New York 20, N. Y.
SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.
STANDARD OIL CO. (INDIANA)
910 South Michigan Ave.
Chicago, Illinois
SUN OIL COMPANY
1608 Walnut Street
Philadelphia, Pennsylvania
THE TEXAS COMPANY
135 East 42 Street
New York, New York
TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, N. Y.

Lubricating Oils, Industrial

MID-CONTINENT PETROLEUM CORPORATION
P. O. Box 381
Tulsa 2, Oklahoma

Lubricators, Force Feed

MADISON-KIPP CORPORATION
Madison 10, Wisconsin
MANZEL DIVISION
FRONTIER INDUSTRIES, INC.
271 Babcock Street
Buffalo 10, N. Y.

Lubricators, Fresh Oil

MADISON-KIPP CORPORATION
Madison 10, Wisconsin

Lubricators, Mechanical

See also "Mechanical Force Feed Oil Systems".

MADISON-KIPP CORPORATION
Madison 10, Wisconsin
MANZEL DIVISION
FRONTIER INDUSTRIES, INC.
271 Babcock Street
Buffalo 10, N. Y.

Lubricators, Multiple Feed

MADISON-KIPP CORPORATION
Madison 10, Wisconsin

Lubricators, Sight Feed

MADISON-KIPP CORPORATION
Madison 10, Wisconsin
MANZEL DIVISION
FRONTIER INDUSTRIES, INC.
271 Babcock Street
Buffalo 10, N. Y.

Machine Shop Products

LEMPCO PRODUCTS, INC.
Dunham Road
Bedford, Ohio

Machine Tools

BROWN & SHARPE MANUFACTURING CO.
Providence 1, Rhode Island
LEMCO PRODUCTS, INC.
Dunham Road
Bedford, Ohio

Machine Tools, Precision

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio
MERLIN ENGINEERING COMPANY, LTD.
Hebble Mills, Salterhebble
Halifax, England

Machine Tools, Surface Grinding

PETERSON WELDING LABS., INC.
1423 Virginia Avenue
Kansas City 6, Missouri

Machines, Boring Universal (Heavy Duty)

CEDAR RAPIDS ENGINEERING COMPANY
902 17th Street, N. E.
Cedar Rapids, Iowa

Machines, Boring, Universal Main & Camshaft

CEDAR RAPIDS ENGINEERING COMPANY
902 17th Street, N. E.
Cedar Radids, Iowa

Machines, Valve Seat Inserting

CEDAR RAPIDS ENGINEERING COMPANY
902 17th Street, N. E.
Cedar Rapids, Iowa

Magnetos, High Tension

AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield, Massachusetts
C. A. V. DIVISION OF LUCAS
ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland, Ohio
SCINTILLA MAGNETO DIVISION
Bendix Aviation Corporation
Sidney, New York

Magnetos, Low Tension

AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield, Massachusetts
SCINTILLA MAGNETO DIVISION
Bendix Aviation Corporation
Sidney, New York

Manifolds

HUNT-SPILLER MFG. CORP.
383 Dorchester Avenue
Boston 27, Mass.

Marine Diesel, Front Gear Driven Accessories

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York
THE NATIONAL SUPPLY COMPANY
ENGINE DIVISION
1401 Sheridan Avenue
Springfield, Ohio

Marine Auxiliary Sets

CLEVELAND DIESEL ENGINE DIVISION
GENERAL MOTORS CORPORATION
2160 West 106 Street
Cleveland, Ohio

Marine Propulsion

STERLING ENGINE COMPANY
1270 Niagara Street
Buffalo 13, New York

Marine Propulsion Gear and Electric Drive

CLEVELAND DIESEL ENGINE DIVISION
GENERAL MOTORS CORPORATION
2160 West 106 Street
Cleveland, Ohio

Marine Reverse & Reduction Gears

THE SNOW-NABSTEDT GEAR CORP.
251 Welton Street
Hamden, Conn.

Melting Furnaces, Induction

OHIO CRANKSHAFT COMPANY
3800 Harvard Avenue
Cleveland, Ohio

Metal Benches, Tool Chests

SNAP-ON TOOLS CORPORATION
8064 28 Avenue
Kenosha, Wisconsin

Metal Spraying & Finishing

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.
ARTHUR TICKLE ENGINEERNG WORKS
21 Delevan Street
Brooklyn 31, N. Y.

Meter, Elapsed Time

BURLINGTON INSTRUMENT COMPANY
203 North 3rd Street
Burlington, Iowa

Meters, Electrical Indicating

See also "Ammeters"

BURLINGTON INSTRUMENT CO.
203 N. 3rd St.
Burlington, Iowa
WESTON ELECTRICAL INSTRUMENT CO.
614 Frelinghuysen Avenue
Newark 5, N. J.

Meters, Fuel Oil

BOWSER, INC.
Fort Wayne 2, Indiana
NEPTUNE METER COMPANY
50 West Street
New York 20, New York
WORTHINGTON CORPORATION
Harrison, New Jersey

Micrometers

BROWN & SHARPE MANUFACTURING COMPANY
Providence 1, Rhode Island

Motor & Generator Brushes

NATIONAL CARBON COMPANY
30 East 42 Street
New York, New York

Motor Fuels

See also "Automotive Diesel Fuel"; "Diesel Fuel Oil"; "Fuel Oil, Diesel"; "Oil, Diesel Fuel".

CITIES SERVICE OIL CO.
60 Wall Tower
New York 5, N. Y.

Motor Generator Sets—Electro Plating, Low Voltage

COLUMBIA ELECTRIC MANUFACTURING CO.
4519 Hamilton Avenue
Cleveland 14, Ohio

IDEAL ELECTRIC & MANUFACTURING CO.
Mansfield, Ohio

Motors, Electric, A. C.

ELECTRIC MACHINERY MFG. CO.
1331 Tyler Street N. E.
Minneapolis 13, Minn.

Motors, Electric, A. C. & D. C.

DELCO PRODUCTS DIVISION
GENERAL MOTORS CORP.
329 East First Street
Dayton 1, Ohio

ELLIOTT COMPANY
Jeanette, Pennsylvania

GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.

IDEAL ELECTRIC & MANUFACTURING CO.
Mansfield, Ohio

KURZ & ROOT, INC.
236 North Island Street
Appleton, Wisconsin

MARATHON ELECTRIC MFG. COMPANY
Wausau, Wisconsin

RELIANCE ELECTRIC & ENGINEERING CO.
1058 Ivanhoe Road
Cleveland 10, Ohio

Motors, Gear

RELIANCE ELECTRIC & ENGINEERING CO.
1058 Ivanhoe Road
Cleveland 10, Ohio

Motor Oils

MID-CONTINENT PETROLEUM CORPORATION
P. O. Box 381
Tulsa 2, Oklahoma

Mufflers, Intake & Exhaust

See also headings under "Silencers".

ALEXANDER-TAGG IND., INC.
Jacksonville Road & Summit Avenue
Hatboro, Pennsylvania

BURGESS-MANNING COMPANY
749 East Park Avenue
Libertyville, Illinois

KITTELL MUFFLER & ENGINEERING COMPANY
915 South Santa Fe Avenue
Los Angeles, California

MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Mufflers, Spark Arresting

ALEXANDER-TAGG IND., INC.
Jacksonville Road & Summit Avenue
Hatboro, Pennsylvania

BURGESS-MANNING COMPANY
749 East Park Avenue
Libertyville, Illinois

KITTELL MUFFLER & ENGINEERING COMPANY
915 South Santa Fe Avenue
Los Angeles, California

MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Nozzle Testers

See also "Injector Test Stand".

AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield, Massachusetts

THE BUDA COMPANY
Harvey, Illinois

C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio

KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Avenue
Franklin Park, Illinois

Nozzles, Fuel Oil Injection

See also "Injectors", etc.

SCINTILLA MAGNETO DIVISION
BENDIX AVIATION CORPORATION
Sidney, New York

Nozzles, Spray, Water Cooled

ADECO PRODUCTS, INC.
5435 North Wolcott Avenue
Chicago 40, Illinois

AMERICAN BOSCH CORP.
3664 Main Street
Springfield 7, Mass.

SCINTILLA MAGNETO DIVISION
BENDIX AVIATION CORPORATION
Sidney, New York

Nozzles, Spray, Water Cooling

See also "Spray Nozzles, Water".

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.

THE MARLEY COMPANY, INC.
222 W. Ggegory Blvd.
Kansas City 5, Missouri

J. F. PRITCHARD & CO.
210 West 10th Street
Kansas City 5, Mo.

SPRAYING SYSTEMS COMPANY
3201 Randolph Street
Bellwood, Illinois

Nuts, Lock

COLUMBIA NUT & BOLT CO., INC.
945 Main Street
Bridgeport 3, Conn.

Oil Conditioners

See also headings under "Centrifuges"; "Conditioners".

BOWSER, INC.
Fort Wayne 2, Indiana

DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York

HILLIARD CORPORATION
120 West 4th Street
Elmira, New York

HONAN-CRANE CORPORATION
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana

U. S. HOFFMAN MACHINERY CORP.
Filtration Division
Thompson Road
Syracuse 6, New York

WINSLOW ENGINEERING COMPANY
4069-73 Hollis Street
Oakland 8, California

Oil Coolers

See also headings under "Coolers"; and "Heat Exchangers"; "Exchangers, Heat".

HENRY VOGT MACHINE CO.
1000 West Ormsby St.
Louisville 10, Ky.

Oil Filters

See also headings under "Filters".

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

FRAM CORP.
Providence 16, R. I.

Oil Purification Systems, Filtering Earth Type

THE HILLIARD CORP.
120 W. Fourth St.
Elmira, N. Y.

HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana

U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
Thompson Road
Syracuse 6, New York

Oil Purification Systems Pressure and Gravity Types

THE HILLIARD CORP.
120 W. Fourth St.
Elmira, N. Y.

HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Ave.
Lebanon, Indiana

U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
Thompson Road
Syracuse 6, New York

WINSLOW ENGINEERING COMPANY
4069-73 Hollis Street
Oakland 8, California

Oil Reclamation Systems

DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York

HONAN-CRANE CORPORATION
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana

U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
Thompson Road
Syracuse 6, New York

WINSLOW ENGINEERING COMPANY
4069-73 Hollis Street
Oakland 8, California

Oil Seals & Grease Retainers

THE FITZGERALD MFG. CO.
Torrington, Conn.

VICTOR MANUFACTURING & GASKET CO.
5750 Roosevelt Avenue
Chicago, Illinois

Oil Separators

CENTRICO, INC.
75 Forest Avenue
Englewood, New Jersey

WINSLOW ENGINEERING COMPANY
4069-73 Hollis Street
Oakland 8, California

Oil Systems, Pressure & Gravity

MANZEL DIVISION
FRONTIER INDUSTRIES, INC.
271 Babcock Street
Buffalo 10, New York

Oil Systems, Pressure & Gravity Type

BOWSER, INC.
Fort Wayne 2, Indiana

MANZEL DIVISION
FRONTIER INDUSTRIES, NC.
271 Babcock Street
Buffalo 10, New York

WM. W. NUGENT & COMPANY, INC.
410 North Hermitage Avenue
Chicago 22, Illinois

Oil Testing Equipment (Engine Room Kits)

THE GERIN CORP.
P. O. Box 653
Red Bank, N. J.

Oils, Diesel Fuel

See also "Automotive Diesel Fuel"; "Diesel Fuel Oil"; "Fuel Oil, Diesel"; "Motor Fuels".

ASHLAND OIL & REFINING CO.
Ashland, Kentucky
GULF OIL CORPORATION
GULF REFINING COMPANY
3702 Gulf Building
Pittsburgh 30, Pa.
LUBER-FINER, INC.
2514 South Grand Avenue
Los Angeles, California
PHILLIPS PETROLEUM CORPORATION
Bartlesville, Oklahoma
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SINCLAIR REFINING CO.
600 Fifth Avenue
New York 20, N. Y.
SUN OIL COMPANY
1608 Walnut Street
Philadelphia 3, Pennsylvania

Overhaul Equipment

THE CLEVELAND PNEUMATIC TOOL CO.
AUTOMOTIVE DIVISION
3799 East 77th
Cleveland 5, Ohio

Packing, Oil Wiper

C. LEE COOK MFG. CO.
76 Beaver Street
New York, N. Y.
DOUBLE SEAL RING CO.
P. O. Box 566
Fort Worth, Texas

Packing, Rod Metallic

C. LEE COOK MFG. CO.
76 Beaver St.
New York, N. Y.
DOUBLE SEAL RING CO.
P. O. Box 566
Fort Worth, Texas

Packing Sheets

VICTOR MANUFACTURING & GASKET COMPANY
5750 Roosevelt Avenue
Chicago, Illinois

Packing Sheets, Oil & Water

THE FITZGERALD MFG. CO.
Torrington, Conn.
VICTOR MANUFACTURING & GASKET COMPANY
5750 Roosevelt Avenue
Chicago, Illinois

Pipe Fittings, Compression

WM. W. NUGENT & CO., INC.
410-412 N. Hermitage Avenue
Chicago 22, Illinois
THE WEATHERHEAD COMPANY
300 East 131 Street
Cleveland 8, Ohio

Piping, Prefabricated

THE AMERICAN BRASS COMPANY
AMERICAN METAL HOSE BRANCH
698 South Main Street
Waterbury 20, Connecticut
FLORI PIPE COMPANY
629 East Red Bud Avenue
St. Louis, Missouri

Piston Pin Bearings

See also headings under "Bearings"

CLEVELAND GRAPHITE BRONZE COMPANY
17000 St. Clair Avenue
Cleveland 10, Ohio

Piston Pins

OHIO PISTON COMPANY
5340 Hamilton Avenue
Cleveland 14, Ohio

Piston Resizing Machines

WAUSAU MOTOR PARTS CO.
1007 Harrison Blvd.
Wausau, Wisconsin

Piston Rings

C. LEE COOK MFG. CO.
76 Beaver St.
New York, N. Y.
DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin
DOUBLE SEAL RING CO.
P. O. Box 566
Fort Worth, Texas
HUNT-SPILLER MFG. CORP.
383 Dorchester Avenue
Boston 27, Mass.
KOPPERS CO., INC.
Koppers Building
Pittsburgh 19, Pa.
SEALED POWER CORP.
500 Sanford Street
Muskegon 61, Michigan
WAUSAU MOTOR PARTS CO.
1007 Harrison Blvd.
Wausau, Wisconsin

Piston Rings, Oil Control

C. LEE COOK MANUFACTURING COMPANY
76 Beaver Street
New York, New York
DOUBLE SEAL RING COMPANY
P. O. Box 566
Fort Worth, Texas
KOPPERS COMPANY, INC.
Koppers Building
Pittsburgh 19, Pennsylvania
SEALED POWER CORPORATION
500 Sanford Street
Muskegon 61, Michigan
WAUSAU MOTOR PARTS COMPANY
1007 Harrison Blvd.
Wausau, Wisconsin

Piston Rings, Sealing

C. LEE COOK MFG. CO.
76 Beaver St.
New York, N. Y.
DOUBLE SEAL RING CO.
P. O. Box 566
Fort Worth, Texas
KOPPERS CO. INC.
Koppers Building
Pittsburgh 19, Pa.
SEALED POWER CORPORATION
500 Sanford Street
Muskegon 61, Michigan
WAUSAU MOTOR PARTS COMPANY
1007 Harrison Blvd.
Wausau, Wisconsin

Pistons

NATIONAL WELDING & GRINDING COMPANY
2929 Canton Street
Dallas 1, Texas
THE OHIO PISTON COMPANY
5340 Hamilton Avenue
Cleveland 14, Ohio
SEALED POWER CORPORATION
500 Sanford Street
Muskegon 61, Michigan

Pistons, Aluminum Alloy

THE OHIO PISTON COMPANY
5340 Hamilton Avenue
Cleveland 14, Ohio
SEALED POWER CORP.
500 Sanford Street
Muskegon 61, Michigan

Pistons, Cast Iron

HUNT-SPILLER MFG. CORP.
383 Dorchester Avenue
Boston 27, Mass.
THE OHIO PISTON COMPANY
5340 Hamilton Avenue
Cleveland 14, Ohio

Plating, Chrome

VAN DER HORST CORP. OF AMERICA
P. O. Box 557
Olean, New York

Plating, Porous Chrome

SPAR-TAN ENGINEERING CO.
Western Licensee—Van Der Horst Corp.
2445 Enterprise St.
Los Angeles 21, Calif.

Pneumatic Tools

CHICAGO PNEUMATIC TOOL COMPANY
6 East 44 Street
New York, New York

Poppet Valve Rebuilding

NATIONAL WELDING & GRINDING COMPANY
2929 Canton Street
Dallas 1, Texas

Portable Contractors' Power Units

See also other headings this page.

WAUKESHA MOTOR CO.
P.O. Box 379
Waukesha, Wisconsin

Portable Power Units

GENERAL ELECTRIC COMPANY
1 River Road
Schenectady 5, N. Y.
A. G. SCHOONMAKER
50 Church Street
New York, New York

Positioning Equipment

THE CLEVELAND PNEUMATIC TOOL CO.
AUTOMOTIVE DIVISION
3799 East 77th
Cleveland 5, Ohio

Power Plants, Automatically Controlled

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio
WAUKESHA MOTOR CO.
P.O. Box 379
Waukesha, Wisconsin

Power Take-Off Units

ROCKFORD CLUTCH DIV.
BORG-WARNER CORP.
1301 18th Ave.
Rockford, Ill.
THE SNOW-NABSTEDT GEAR CORP.
251 Welton Street
Hamden, Conn.

Power Units

CONTINENTAL MOTORS CORP.
Muskegon, Michigan
CUMMINS ENGINE COMPANY
Columbus, Indiana
HERCULES MOTOR CORP.
11th & Market S. E.
Canton 2, Ohio
WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

Power Units, Pump Take Off

CLEVELAND DIESEL ENGINE DIVISION
General Motors Corporation
2160 West 106th Street
Cleveland 11, Ohio

Presses, Arbor, Electric & Hydraulic

LEMPCO PRODUCTS, INC.
Dunham Road
Bedford, Ohio

Pressure Switches

PENN CONTROLS, INC.
Goshen, Indiana
ROCHESTER MANUFACTURING CO., INC.
101 Rockwood Street
Rochester 10, N. Y.
SYNCHRO-START PRODUCTS, INC.
8151 North Ridgeway Avenue
Skokie, Illinois

Pressuregraph

ELECTRO PRODUCTS LABORATORIES, INC.
4501 North Ravenswood Avenue
Chicago 40, Illinois

Pullers, Gear, Wheel, Bushing

SNAP-ON TOOLS CORP.
8064—28th Avenue
Kenosha, Wisconsin

Pumping Units, Diesel

See also "Diesel Pumping Units".

GRIFFIN EQUIPMENT CORP.
880 E. 141 Street
New York, New York

Pumps, Automatic Reversing

BROWN & SHARPE MANUFACTURING COMPANY
Providence 1, Rhode Island
TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.
VIKING PUMP CO.
Cedar Falls, Iowa

Pumps, Centrifugal

BROWN & SHARPE MFG. CO.
Providence 1, R. I.
INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.
WORTHINGTON CORPORATION
Harrison, New Jersey

Pumps, Centrifugal Corrosion Resistant

NATIONAL CARBON COMPANY
DIVISION OF UNION CARBIDE AND CARBON CORP.
30 E. 42nd St.
New York, New York

Pumps, Cooling Water

SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis, Ind.
VIKING PUMP CO.
Cedar Falls, Iowa
WORTHINGTON CORPORATION
Harrison, New Jersey

Pumps, Fuel Oil Injection

See also "Injection Equipment", etc.

AMERICAN BOSCH CORP.
3664 Main Street
Springfield 7, Mass.
DIESEL INJECTION SALES & SERVICE
808 Union Street
Norfolk, Virginia
HARTFORD MACHINE SCREW COMPANY
Box 1440
Hartford 2, Connecticut
SCINTILLA MAGNETO DIV.
BENDIX AVIATION CORP.
Sidney, N. Y.
E. A. WILDERMUTH
1102 Atlantic Ave.
Brooklyn 16, N. Y.
WORTHINGTON CORPORATION
Harrison, New Jersey

Pumps, Fuel Transfer

GEO. D. ROPER CORP.
160 Blackhawk Park Avenue
Rockford, Ill.
TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.
VIKING PUMP CO.
Cedar Falls, Iowa
WORTHINGTON CORPORATION
Harrison, New Jersey

Pumps, Hydraulic

BROWN & SHARPE MANUFACTURING CO.
Providence 1, Rhode Island
GEORGE D. ROPER CORPORATION
160 Blackhawk Park Avenue
Rockford, Illinois
VIKING PUMP COMPANY
Cedar Falls, Iowa

Pumps, Hydraulic Controls

GEORGE D. ROPER CORPORATION
160 Blackhawk Park Avenue
Rockford, Illinois
TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.

Pumps, Lubricating Oil

EATON MANUFACTURING COMPANY
740 East 140 Street
Cleveland, Ohio
MANZEL DIVISION
FRONTIER INDUSTRIES, INC.
271 Babcock Street
Buffalo 10, N. Y.
GEO. D. ROPER CORP.
160 Blackhawk Park Avenue
Rockford, Ill.
SCHWITZER-CUMMINS
1125 Massachusetts Avenue
Indianapolis 7, Indiana
TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19. Ill.
VIKING PUMP CO.
Cedar Falls, Iowa
WORTHINGTON CORPORATION
Harrison, New Jersey

Pumps, Oil

BOWSER, INC.
Fort Wayne 2, Indiana
MANZEL, DIV. OF FRONTIER INDUSTRIES, INC.
271 Babcock Street
Buffalo 10, New York
WM. W. NUGENT & CO., INC.
410-412 N. Hermitage Ave.
Chicago 22, Illinois
GEO. D. ROPER CORP.
160 Blackhawk Park Avenue
Rockford, Ill.
VIKING PUMP CO.
Cedar Falls, Iowa
WORTHINGTON CORPORATION
Harrison, New Jersey

Pumps, Piston, Plunger Type

WORTHINGTON CORPORATION
Harrison, New Jersey

Pumps, Rotary Gear Type

BROWN & SHARPE MFG. CO.
Providence 1, R. I.
GEO. D. ROPER CORP.
160 Blackhawk Park Avenue
Rockford, Ill.
TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19. Ill.
VIKING PUMP CO.
Cedar Falls, Iowa
WORTHINGTON CORPORATION
Harrison, New Jersey

Pumps, Rotary, Hand-Driven

BOWSER, INC.
Fort Wayne 2, Indiana

Pumps, Rotary, Vane-type

BROWN & SHARPE MANUFACTURING COMPANY
Providence 1, Rhode Island

Pumps, Stripped Models

BROWN & SHARPE MFG. CO.
Providence 1, R. I.
GEO. D. ROPER CORP.
160 Blackhawk Park Ave.
Rockford, Illinois
TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.
VIKING PUMP CO.
Cedar Falls, Iowa

Pumps, Vacuum

CHICAGO PNEUMATIC TOOL COMPANY
6 East 44 Street
New York, New York
QUINCY COMPRESSOR COMPANY
217 Maine Street
Quincy, Illinois
READ STANDARD CORP.
370 Lexington Avenue
New York 17, N. Y.
WORTHINGTON CORPORATION
Harrison, New Jersey

Purifiers, Fuel Oil

See also "Reclaimers, Oil"; and headings under "Oil".

THE BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
CENTRICO, INC
75 Forest Avenue
Englewood, New Jersey
THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.
FRAM CORP.
Providence 16, R. I.
THE HILLIARD CORP.
120 West 4th St.
Elmira, N. Y.
LUBER-FINER, INC.
2514 South Grand Avenue
Los Angeles, California
THE SHARPLES CORPORATION
2300 Westmoreland Street
Philadelphia 40, Pennsylvania
U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
Thompson Road
Syracuse 6, New York
WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.

Purifiers, Industrial Oil

See Heading Above.

THE BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
CENTRICO, INC.
75 Forest Avenue
Englewood, New Jersey
FRAM CORPORATION
Providence 16, R. I.
THE HILLIARD CORP.
120 W. Fourth St.
Elmira, N. Y.
LUBER-FINER, INC.
2514 South Grand Avenue
Los Angeles, California

THE SHARPLES CORPORATION
2300 Westmoreland Street
Philadelphia 40, Pennsylvania
WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.

Purifiers, Lubricating Oil

See also "Reclaimers, Oil"; and headings under "Oil".

THE BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
CENTRICO, INC.
75 Forest Avenue
Englewood, New Jersey
THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.
THE HILLIARD CORP.
120 West 4th Street
Elmira, N. Y.
LUBER-FINER, INC.
2514 South Grand Avenue
Los Angeles, California
THE SHARPLES CORPORATION
2300 Westmoreland Street
Philadelphia 40, Pennsylvania
U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
214 Lamson Street
Syracuse 6, New York
WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.

Purifiers, Oil

See heading above.

THE BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.
CENTRICO, INC
75 Forest Avenue
Englewood, New Jersey
THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.
FRAM CORP.
Providence 16, R. I.
THE HILLIARD CORP.
120 West 4th St.
Elmira, N. Y.
LUBER-FINER, INC.
2514 South Grand Avenue
Los Angeles, California
THE SHARPLES CORPORATION
2300 Westmoreland Street
Philadelphia 40, Pennsylvania

Pyrometers, Exhaust

ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle St.
Chicago 10, Ill.

Pyrometers, Portable

ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle St.
Chicago 10, Ill.

Pyrotac

ILLINOIS TESTING LABORATORIES, INC.
420 North LaSalle Street
Chicago, Illinois

Radiator Cooling System Treatment

D. W. HAERING & CO., INC.
P. O. Box 6037
Harlandale Station
San Antonio, Texas
SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.

Radiators, Engine Cooling

HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, N. Y.
YOUNG RADIATOR CO.
Racine, Wis.

Rail Car Engines

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio
CUMMINS ENGINE COMPANY
Columbus, Indiana

Reamers, Adjustable, Replaceable Blades

LEMPCO PRODUCTS, INC.
Dunham Road
Bedford, Ohio

Rebabbitting, Centrifugal

SIGURD GOLTEN MACHINE CORP.
455 Carroll Street
Brooklyn 15, N. Y.

Reclaimers, Oil

See also headings under "Purifiers" and "Oil".

THE HILLIARD CORP.
120 West 4th St.
Elmira, N. Y.

Regulators, Current & Voltage

See also headings under "Voltage".

DELCO-REMY DIVISION
GENERAL MOTORS CORP.
2401 Columbus Ave.
Anderson, Indiana
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.
ELECTRIC REGULATOR CORPORATION
Pearl Street
Norwalk, Connecticut
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Chicago 7, Illinois
MARINE & COMMERCIAL DIVISION
THE SAFETY CAR HEATING & LIGHTING COMPANY, INC.
P. O. Box 904
New Haven, Connecticut

Regulators, Generator Voltage

AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield, Massachusetts
BURLINGTON INSTRUMENT COMPANY
203 N. 3rd Street
Burlington, Iowa
ELECTRIC REGULATOR CORPORATION
Pearl Street
Norwalk, Connecticut
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Regulators, Temperature

AMERICAN MOTORS CO.
21 Nevin Avenue
Richmond 5, Calif.
BARBER-COLMAN COMPANY
1300 Rock Street
Rockford, Illinois
FULTON-SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tennessee
PENN CONTROLS, INC.
Goshen, Indiana

Relays

MARINE & COMMERCIAL DIVISION
THE SAFETY CAR HEATING & LIGHTNG COMPANY, INC.
P. O. Box 904
New Haven, Connecticut
SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Avenue
Skokie, Illinois

Relays, Sensitive

WESTON ELECTRICAL INSTRUMENT COMPANY
614 Frelinghuysen Avenue
Newark 5, New Jersey

Repairs, Diesel

See also "Diesel Repairs"; "Diesel Engines Reconditioned".

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York
SIGURD GOLTEN MACHINE CORP.
455 Carroll Street
Brooklyn 15, N. Y.
GRIFFIN EQUIPMENT CORP.
880 E. 141 Street
New York, New York
NATIONAL WELDING & GRINDING COMPANY
2929 Canton
Cleveland, Ohio
ARTHUR TICKLE ENGINEERING WORKS
21 Delevan Street
Brooklyn 31, N. Y.
E. A. WILDERMUTH INC.
1102 Atlantic Ave.
Brooklyn 16, N. Y.

Replacement Engines For Ford Or Chevrolet Trucks

HERCULES MOTOR CORP.
11th & Market S. E.
Canton 2, Ohio

Reversing Switches

COLUMBIA ELECTRIC MANUFACTURING CO.
4519 Hamilton Avenue
Cleveland 14, Ohio

Rheostats, Plating Tank Type

COLUMBIA ELECTRIC MANUFACTURING CO.
4519 Hamilton Avenue
Cleveland 14, Ohio

Rotary Pumps

WORTHINGTON CORPORATION
Harrison, N. J.

Rotor Blower Service Tools

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Rust Preventives

See also "Anti-Rust Compounds"

ASHLAND OIL & REFINING CO.
Ashland, Kentucky
GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Bldg.
Pittsburgh 30, Pa.
D. W. HAERING & CO., INC.
P. O. Box 6037
Harlandale Station
San Antonio, Texas
OAKITE PRODUCTS, INC.
22 Thames St.
New York 6, N. Y
SINCLAIR REFINING CO.
600 Fifth Avenue
New York 20, N. Y.
SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.
STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street
San Francisco 20, California
THE TEXAS COMPANY
135 E. 42 St.
New York 17, N. Y.
YOUNG RADIATOR CO.
Racine, Wisconsin

Rust Removers

OAKITE PRODUCTS, INC.
22 Thames St.
New York 6, N. Y.

Safety Controls, Engine

See also "Controls, Engine Safety"

FULTON-SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tennessee

SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Ave.
Skokie, Ill.

Scale Removal

D. W. HAERING & CO., INC.
P. O. Box 6037
Harlandale Station
San Antonio 4, Texas
OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.

Schools, Diesel Mechanics

See also "Diesel Schools".
INTERSTATE TRAINING SERVICE
4035 N. E. Sandy Blvd.
Portland, Oregon

Screw Machine Products

COLUMBIA NUT & BOLT CO., INC.
945 Main Street
Bridgeport 3, Connecticut
HARTFORD MACHINE SCREW COMPANY
Box 1440
Hartford 2, Connecticut
WEATHERHEAD COMPANY
300 East 131st St.
Cleveland 8, Ohio

Screw Machine Products, Hardened & Ground

EATON MANUFACTURING COMPANY
740 East 140 Street
Cleveland 10, Ohio
HARTFORD MACHINE SCREW COMPANY
Box 1440
Hartford 2, Connecticut

Scuffing Rings

A. ALLAN & SON
601 Bergen Street
Harrison, N. J.

Sealing Rings

KOPPERS CO., INC.
Koppers Building
Pittsburgh 19, Pa.

Seals, Automatic Shaft

SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis 7, Ind.

Self Retaining Nuts

COLUMBIA NUT & BOLT CO., INC.
945 Main Street
Bridgeport 3, Conn.

Separators

See also headings under "Centrifuges"; Conditioners"; Purifiers"; "Clarifiers".
AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York
CENTRICO, INC.
75 Forest Avenue
Englewood, New Jersey
DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.

Shafts, Steel, Carbon Alloy

ERIE FORGE & STEEL CORPORATION
15 & Cascade Streets
Erie, Pennsylvania

Shock Absorbers

DELCO PRODUCTS DIVISION
GENERAL MOTORS CORP.
329 East First Street
Dayton 1, Ohio

Silencers, Air Filter, Intake

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio
AMERICAN AIR FILTER CO., INC.
445 Central Avenue
Louisville 8, Kentucky
BURGESS-MANNING CO.
749 East Park Ave.
Libertyville, Ill.

Silencers, Exhaust

See also headings under "Mufflers".
ALEXANDER-TAGG IND. INC.
Jacksonville Road & Summit Avenue
Hatboro, Pennsylvania
BURGESS-MANNING CO.
749 East Park Ave.
Libertyville, Ill.
DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin
KITTELL MUFFLER & ENGINEERING CO.
915 South Santa Fe Avenue
Los Angeles, California
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.
WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.

Silencers, Intake

See heading above.
AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio
ALEXANDER-TAGG IND. INC.
Jacksonville Road & Summit Avenue
Hatboro, Pennsylvania
BURGESS-MANNING CO.
749 East Park Ave.
Libertyville, Ill.
DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin

Silencers, Spark Arresting

MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Snubbers, Intake & Exhaust

BURGESS-MANNING CO.
749 East Park Avenue
Libertyville, Illinois

Snubbers, Spark Arresting

BURGESS-MANNING CO.
749 East Park Avenue
Libertyville, Illinois
KITTELL MUFFLER & ENGINEERING CO.
915 South Santa Fe Avenue
Los Angeles, California

Solenoids, D. C., Continuous Duty

SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Avenue
Skokie, Illinois

Solvents

CITIES SERVICE OIL CO.
60 Wall Tower
New York 5, N. Y.

Solvents, Degreasing

GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Building
Pittsburgh 30, Pa.
OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.
SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.

Solvents for Petroleum Residues

GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Building
Pittsburgh 30, Pa.
OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.
SOCONY-VACUUM OIL CO.
26 Broadway
New York 4, N. Y.

Spark Arrestors

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio
KITTELL MUFFLER & ENGINEERING CO.
915 South Santa Fe Avenue
Los Angeles, California
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Spark Ignition Engines

WORTHINGTON CORPORATION
Harrison, New Jesrey

Spark Plugs

THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio

Special Maintenance Tools

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Special Tools, Mechanical Gear Box

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Speed Reducers and Increasers

BRAD FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois
FOOTE BROS. GEAR & MACHINE CORPORATION
4545 South Western Boulevard
Chicago, Illinois
THE SNOW-NABSTEDT GEAR CORP.
251 Welton Street
Hamden 7, Conn.
WORTHINGTON CORPORATION
Harrison, New Jersey

Spray Nozzles, Fuel Injection

See also under "Nozzles"; "Valves".
AMERICAN BOSCH CORP.
3664 Main St.
Springfield 7, Mass.
C. A. V. DIVISION of
LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
DIESEL INJECTION SALES & SERVICE
808 Union Street
Norfolk, Virginia
SCINTILLA MAGNETO DIV.
BENDIX AVIATION CORP.
Sidney, N. Y.
UNEX PRODUCTS CORPORATION
30 Vesey Street
N. Y. 7, N. Y.

Spray Nozzles, Water

See also "Nozzles, Spray, Water Cooling".
BINKS MANUFACTURING CO.
3114 Carroll Avenue
Chicago 12, Illinois
J. F. PRITCHARD & CO.
210 West 10 Street
Kansas City 5, Mo.
SPRAYING SYSTEMS COMPANY
3201 Randolph Street
Bellwood, Illinois

Spray Ponds

BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.
MARLEY CO., INC.
222 W. Gregory Blvd.
Kansas City 5, Missouri

Spray Towers

See also "Cooling Towers".
BINKS MFG. CO.
3114 Carroll Ave.
Chicago 12, Ill.

THE MARLEY CO. INC.
222 W. Gregory Blvd.
Kansas City 5, Missouri
J. F. PRITCHARD & CO.
210 West 10 Street
Kansas City 5, Mo.

Sprockets

MORSE CHAIN COMPANY
7601 Central
Detroit 10, Michigan

Stands, Engine

See also "Engine Repair Stands".

THE CLEVELAND PNEUMATIC TOOL CO.
AUTOMOTIVE DIVISION
3799 East 77th
Cleveland 5, Ohio

Starting Air Compressors, Engine Driven

See also headings under "Compressors"

INGERSOLL-RAND CO.
11 Broadway
New York, N. Y.

Starting Air Compressors, Motor Driven

See also headings above

INGERSOLL RAND CO.
11 Broadway
New York, N. Y.

Starting Batteries, Storage

See also headings under "Batteries".

DELCO-REMY DIVISION
GENERAL MOTORS CORP.
2401 Columbus Ave.
Anderson, Indiana
ELECTRIC STORAGE BATTERY CO.
42 South 15 Street
Philadelphia 2, Pa.
SURRETTE STORAGE BATTERY CO., INC.
Jefferson Avenue
Salem, Massachusetts

Starting Engines, Gasoline

HERCULES MOTOR CORP.
11th & Market S. E.
Canton 2, Ohio

Starting Motors, Air

INGERSOLL-RAND CO.
11 Broadway
New York, N. Y.
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Starting Motors, Electric

See also "Cranking Motors, Electric".

C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
DELCO-REMY DIV.
GENERAL MOTORS CORP.
2401 Columbus Ave.
Anderson, Indiana
THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio
E. A. WILDERMUTH INC.
1102 Atlantic Avenue
Brooklyn 16, N. Y.

Steam Cleaning Equipment

KELITE PRODUCTS, INC.
P. O. Box 2917
Terminal Annex Station
Los Angeles 54, California
OAKITE PRODUCTS, INC.
22 Thames St.
New York 6, N. Y.

Steel Camshaft Repair

NATIONAL WELDING & GRINDING CO.
2929 Canton Street
Dallas 1, Texas

Steel Castings

See also "Castings"; etc.

HUNT-SPILLER MFG. COMPANY
383 Dorchester Avenue
Boston 27, Mass.

Steel Pipe, Welded

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

Strainers, Gasoline and Light Fuel Oil

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio

Strainers, Oil

AIR MAZE CORP.
5200 Harvard Ave.
Cleveland 5, Ohio
BOWSER, INC.
Fort Wayne 2, Indiana
CUNO ENGINEERING CORP.
80 South Vine St.
Meriden, Conn.
ELLIOTT COMPANY
Jeanette, Penna.
WILLIAM W. NUGENT & CO., INC.
410 N. Hermitage Ave.
Chicago 22, Ill.
PUROLATOR PRODUCTS, INC.
970 New Brunswick Avenue
Rahway, New Jersey

Strainers, Water

CUNO ENGINEERING CORP.
80 South Vine St.
Meriden, Conn.
ELLIOTT COMPANY
Jeanette, Penna.
SPRAYING SYSTEMS COMPANY
3201 Randolph Street
Bellwood, Illinois

Strainers, Water, Single & Duplex

CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Connecticut
ELLIOTT COMPANY
Jeannette, Pa.

Supercharger Intercoolers

See also "Intercoolers" and "Aftercoolers"

YOUNG RADIATOR CO.
Racine, Wis.

Supercharging Blowers

See also "Blowers, Scavenging and Supercharging"; "Tubochargers, Superchargers".

ELLIOTT COMPANY
Jeanette, Penna.
READ STANDARD CORP.
370 Lexington Ave.
New York 17, N. Y.
SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis 7, Ind.

Switchboards and Instruments

IDEAL ELECTRIC & MFG. CO.
Mansfield, Ohio
WESTON ELECTRICAL INSTRUMENT CORP.
614 Frelinghuysen Avenue
Newark 5, New Jersey

Switches, Electric Starting

DELCO-REMY DIV.
GENERAL MOTORS CORP.
2401 Columbus Avenue
Anderson, Indiana

Switches, Engine Safety

ROCHESTER MFG. CO., INC.
101 Rockwood Street
Rochester 10, N. Y.

Switches, Solenoid

DELCO-REMY DIV.
GENERAL MOTORS CORP.
2401 Columbus Avenue
Anderson, Indiana
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio
SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Avenue
Skokie, Illinois

Switches, Starting

DELCO-REMY DIVISION
GENERAL MOTORS CORP.
2401 Columbus Ave.
Anderson, Indiana
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio
SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Avenue
Skokie, Illinois

Switchgear

ELECTRIC MACHINERY & MFG. CO.
1331 Tyler St., N.E.
Minneapolis 13, Minn.
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.
IDEAL ELECTRIC & MFG. CO.
Mansfield, Ohio

Synchronizers, Automatic

BURLINGTON INSTRUMENT CO.
203 N. 3d St.
Burlington, Iowa
ELECTRIC MACHINERY MFG. CO.
1331 Tyler Street N. E.
Minneapolis 13, Minn.

Systems, Fuel Injection

See also headings under "Injection"; "Fuel"; "Nozzles", etc.

DIESEL INJECTION SALES & SERVICE
808 Union Street
Norfolk, Virginia

Tachometers

RELIANCE ELECTRIC & ENG. CO.
1058 Ivanhoe Road
Cleveland 10, Ohio

Tachometers, Centrifugal

JAMES G. BIDDLE CO.
1316 Arch Street
Philadelphia 7, Pennsylvania
HERMAN H. STICHT CO., INC.
27 Park Place
New York 7, New York

Tachometers, Electrical

JAMES G. BIDDLE CO.
1316 Arch Street
Philadelphia 7, Pennsylvania
HERMAN H. STICHT CO., INC.
27 Park Place
New York 7, New York
WESTON ELECTRICAL INSTRUMENT CO.
614 Frelinghuysen Avenue
Newark 5, New Jersey

Tachometers, Hand

HERMAN H. STICHT CO., INC.
27 Park Place
New York 7, New York

Tachometers, Hand, Resonant Reed Type

JAMES G. BIDDLE CO.
1316 Arch Street
Philadelphia 7, Pennsylvania

Tachometers, Mechanical

JAMES G. BIDDLE CO.
1316 Arch Street
Philadelphia 7, Pennsylvania

HERMAN H. STICHT CO., INC.
27 Park Place
New York 7, New York

Temperature Recorders

BARBER-COLMAN COMPANY
1300 Rock Street
Rockford, Illinois
THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois

Temperature Regulators, Cooling Water

AMERICAN MOTORS CO
21 Nevin Ave.
Richmond, Calif.
BARBER-COLMAN COMPANY
1300 Rock Street
Rockford, Illinois
FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tenn.
THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois

Temperature, Regulators, Lubricating Oil

AMERICAN MOTORS COMPANY
21 Nevin Avenue
Richmond 5, California

Test Stands, Diesel Fuel Injector

See also "Injector Test Stands"; etc.

AUTOMOTIVE PRODUCTS, INC.
1700 Southeast Grand
Portland 14, Oregon

Testers, Battery

ELECTRIC STORAGE BATTERY CO.
42 South 15 Street
Philadelphia 2, Pensylvania

Testing Instruments, Electrical

JAMES G. BIDDLE CO.
1316 Arch Street
Philadelphia 7, Pennsylvania
ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Ave.
Chicago 40, Ill.
GENERAL ELECTRIC CO.
1 River Road
Schenectady 5, N. Y.
HERMAN H. STICHT CO., INC.
27 Park Place
New York 7, New York
WESTON ELECTRICAL INSTRUMENT CORP.
614 Frelinghuysen Avenue
Newark 5, New Jersey

Testing Instruments, Oil, Engine Room Type

GERIN CORPORATION
P. O. Box 653
Red Bank, New Jersey

Thermocouples

BARBER-COLMAN COMPANY
1300 Rock Street
Rockford, Illinois
ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle St.
Chicago 10, Ill.

Thermometers

WEKSLER THERMOMETER CORPORATION
Martinique Building
49 West 32 Street
New York, New York

Thermometers, Bi-metallic, Glass

WESTON ELECTRICAL INSTRUMENT CORP.
614 Frelinghuysen Avenue
Newark 5, New Jersey

Thermometers, Dial Indicator

THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio
THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois
ROCHESTER MFG. CO., INC.
101 Rockwood Street
Rochester 10, N. Y.
WEKSLER THERMOMETER CORPORATION
Martinique Building
49 West 32 Street
New York, New York

Thermometers, Dial Indicating, Distance Type

ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle Street
Chicago 10, Illinois
THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois
WEKSLER THERMOMETER CORPORATION
Martinique Building
49 West 32 Street
New York, New York

Thermometers, Distant Reading, Resistance Type

WESTON ELECTRICAL INSTRUMENT CORP.
614 Frelinghuysen Avenue
Newark 5, New Jersey

Thermometers, Flue Gas

WEKSLER THERMOMETER CORPORATION
Martinique Building
49 West 32 Street
New York, New York

Thermometers, Indicating

BARBER-COLMAN COMPANY
1300 Rock Street
Rockford, Illinois
WEKSLER THERMOMETER CORPORATION
Martinique Building
49 West 32 Street
New York, New York

Thermometers, Portable Recording

THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio
WEKSLER THERMOMETER CORPORATION
Martinique Building
49 West 32 Street
New York, New York

Timing Chains

See also "Chains, Timing"

LINK-BELT CO.
220 S. Belmont Ave.
Indianapolis 6, Ind.

Tools, Diesel Engine Service

MERLIN ENGINEERING COMPANY, LTD.
Hobble Hills
Salterhebble, Halfax
Yorks, England
SNAP-ON TOOLS CORPORATION
8064 28th Avenue
Kenosha, Wisconsin

Tools, Mechanic's Hand

BROWN & SHARPE MFG. CO.
Providence 1, R. I.
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Bldg.
Detroit 2, Michigan
SNAP-ON TOOLS CORP.
8064 — 28th Ave.
Kenosha, Wis.

Towers, Cooling

See also "Cooling Towers"; "Spray Towers".

J. F. PRITCHARD & CO.
210 West 10 Street
Kansas City 5, Missouri

Transmission Jacks

THE CLEVELAND PNEUMATIC TOOL CO.
AUTOMOTIVE DIVISION
3799 East 77th
Cleveland 5, Ohio

Tubing, Corrugated, Flexible Metallic

See also headings under "Flexible" and Hose".

ALLIED METAL HOSE CO.
37-46 Ninth Street
Long Island City 1, N. Y.
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO., INC.
123 W. 64th Street
New York 23, N. Y.
PENN FLEXIBLE METALLIC TUBING
7271 Powers Lane
Philadelphia 42, Pa.

Tubing, Flexible Metal

See heading above.

ALLIED METAL HOSE CO.
37-46 Ninth Street
Long Island City 1, N. Y.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO., INC.
123 West 64th Street
New York 23, N. Y.
PENN FLEXIBLE METALLIC TUBING
7271 Powers Lane
Philadelphia 42, Pa.

Tubing, Flexible, Non-Metallic

AERO-COUPLING CORPORATION
3015 Winona Avenue
Burbank, California
AEROQUIP CORP.
Jackson, Michigan
AMERICAN VENTILATING HOSE COMPANY
DIVISION OF
CALLAHAN ZINC-LEAD COMPANY, INC.
100 Park Avenue
New York 17, New York
WEATHERHEAD COMPANY
300 East 131st St.
Cleveland 8, Ohio

Tubing, High Pressure

THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.

Turbochargers, Superchargers

See also headings under "Blowers"; "Supercharging Blowers"; "Scavenging Air Blowers".

ELLIOTT COMPANY
Jeanette, Penna.
SCHWITZER-CUMMINS COMPANY
1125 Massachusetts Avenue
Indianapolis 7, Indiana

Unit Injectors, Fuel Oil

AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield, Massachusetts
DIESEL INJECTION SALES & SERVICE
808 Union Street
Norfolk, Virginia
SCINTILLA MAGNETO DIV.
BENDIX AVIATION CORP.
Sidney, New York

Valve Adjusters, Hydraulic

EATON MANUFACTURING CO.
740 East 140th Street
Cleveland 10, Ohio

Valve Guides

EATON MANUFACTURING CO.
740 East 140th Street
Cleveland 10, Ohio

Valve Regrinders

CEDAR RAPIDS ENGINEERING CO.
902 17th St. NE.
Cedar Rapids, Iowa
MERLIN ENGINEERING COMPANY, LTD
Hobble Hills
Salterhebble, Halifax
Yorks, England

SNAP-ON TOOLS CORPORATION
8064 28th Avenue
Kenosha, Wisconsin
VAN NORMAN COMPANY
Automotive Division
Springfield 7, Mass.

Valve Seat Grinders

CEDAR RAPIDS ENGINEERING CO.
902 17th St. NE.
Cedar Rapids, Iowa
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Valve Seat Inserts

EATON MANUFACTURING CO.
740 East 140th Street
Cleveland 10, Ohio
NATIONAL WELDING & GRINDING CO.
2929 Canton Street
Dallas 1, Texas
PETERSON WELDING LABS., INC.
1423 Virginia Avenue
Kansas City 6, Missouri
WAUSAU MOTOR PARTS COMPANY
1005 Harrison Boulevard
Wausau, Wisconsin

Valve Seats

EATON MANUFACTURING CO.
740 East 140th Street
Cleveland 10, Ohio

Valve Tappets

EATON MANUFACTURING CO.
740 East 140th Street
Cleveland 10, Ohio

Valve, Thermostatic

BARBER-COLMAN COMPANY
1300 Rock Street
Rockford, Illinois
THE POWERS REGULATOR COMPANY
3410 Oakton Street
Skokie, Illinois

Valves, Engine Indicator

KIENE DIESEL ACCESSORIES INC.
10352 Pacific Avenue
Franklin Park, Illinois

Valves, Packless

FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tenn.

Valves, Poppet (Exhaust & Inlet)

EATON MANUFACTURING CO.
740 East 140th Street
Cleveland 10, Ohio

Valves, Sight Feed

WILLIAM W. NUGENT & CO.
410 No. Hermitage Avenue
Chicago 22, Ill.

Valves, Solenoid Operated

ATOMATIC SWITCH COMPANY
391 Lakeside Ave.
Orange, N. J.
PENN CONTROLS, INC.
Goshen, Indiana

Valves, Thermostatic

AMERICAN MOTORS CO.
21 Nevin Ave.
Richmond, Calif.

Valves, Three Way

AMERICAN MOTORS CO.
21 Nevin Avenue
Richmond 5, California
DAVIS ENGINEERING CORP.
1064 East Grand Street
Elizabeth 4, New Jersey
WEATHERHEAD COMPANY
300 East 131st St.
Cleveland 8, Ohio

Variable Speed Drives

EATON MANUFACTURING COMPANY
740 East 140 Street
Cleveland 10, Ohio
ELECTRIC MACHINERY MFG. CO.
1331 Tyler Street NE
Minneapolis 13, Minnesota

Variable Speed Transmissions

WORTHINGTON CORPORATION
Harrison, New Jersey

Vent Duct, Flexible

AMERICAN VENTILATING HOSE COMPANY
DIVISION OF
CALLAHAN ZINC-LEAD COMPANY, INC.
100 Park Avenue
New York 17, New York

Vibration Control

THE AMERICAN BRASS COMPANY
AMERICAN METAL HOSE BRANCH
698 South Main Street
Waterbury 20, Conn.

Vibration Eliminators

ALLIED METAL HOSE CO.
37-46 Ninth Street
Long Island City 1, N. Y.
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO., INC.
109 West 64 Street
New York 23, New York
SCHWITZER-CUMMINS COMPANY
1125 Massachusetts Avenue
Indianapolis 7, Indiana

Vibration Indicator

ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Avenue
Chicago 40, Illinois

Viscosity Indicating Devices

THE GERIN CORPORATION
P. O. Box 653
Red Bank, N. J.

Voltage Regulators

BURLINGTON INSTRUMENT CO.
203 W. 3rd St.
Burlington, Iowa
ELECTRIC MACHINERY MFG. CO.
1331 Tyler Street, N. E.
Minneapolis 13, Minn.
ELECTRIC REGULATOR CORPORATION
Pearl Street
Norwalk, Connecticut
MARINE & COMMERCIAL DIVISION
THE SAFETY CAR HEATING & LIGHTING COMPANY, INC.
P. O. Box 904
New Haven, Connecticut

Volt-Ammeters, Clamp-on Type

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave.
Cleveland 14, Ohio
HERMAN H. STICHT CO., INC.
27 Park Place
New York 7, New York

Washers

See also "Bronze Washers"
EATON MANUFACTURING CO.
740 East 140th Street
Cleveland, Ohio

Washers, Bronze & Steel, Bronze-Lined

See also "Bronze Washers"
CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Avenue
Cleveland 10, Ohio
FEDERAL-MOGUL CORPORATION
11031 Shoemaker Avenue
Detroit 13, Michigan

Waste Heat Boilers

See also "Boilers, Waste Heat"; "Boilers, Exhaust Gas".
AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York
DAVIS ENGINEERING CORP.
1064 East Grand Avenue
Elizabeth 4, New Jersey
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Water Cooling Equipment

See also headings under "Coolers" and "Heat Exchangers"; "Exchangers, Heat".
AEROFIN CORPORATION
410 S. Geddes Street
Syracuse 1, New York
AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York
MARLEY CO., INC.
222 West Gregory Blvd.
Kansas City 5, Missouri
J. F. PRITCHARD & CO.
210 West 10 Street
Kansas City 5, Missouri

Water Heaters, Waste Heat

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York
DAVIS ENGINEERING CORP.
1064 East Grand Avenue
Elizabeth 4, New Jersey

Water Purification Systems

ELGIN SOFTENER CORP.
133 North Grove Avenue
Elgin, Illinois
WORTHINGTON CORPORATION
Harrison, New Jersey

Water-Oil Separators

HONAN-CRANE CORPORATION
Subsidiary of HOUDAILLE-HERSHEY CORP
305 Wabash Avenue
Lebanon, Indiana

Water Softeners

ELGIN SOFTENER CORP.
133 North Grove Avenue
Elgin, Illinois
WORTHINGTON CORPORATION
Harrison, New Jersey

Water Temperature Regulators

See also "Temperature Regulators, Cooling Water"; "Regulators, Temperature".
AMERICAN MOTORS CO.
21 Nevin Avenue
Richmond, California
BARBER-COLMAN COMPANY
1300 Rock Street
Rockford, Illinois
THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois

Water Treatment

D. W. HAERING & CO., INC.
P. O. Box 6037
Harlandale Station
San Antonio 4, Texas

Wearing Rings

A. ALLAN & SON
601 Bergen Street
Harrison, N. J.

Welding, Carbon Products

NATIONAL CARBON COMPANY
DIVISION OF UNION CARBIDE AND CARBON CORP.
30 E. 42nd St.
New York, New York

Welding, Diesel Parts

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.
ARTHUR TICKLE ENGINEERING WORKS
21 Delevan Street
Brooklyn 31, N. Y.
WASHINGTON IRON WORKS
Sherman, Texas

Weldments
FLORI PIPE COMPANY
629 East Red Bud Avenue
St. Louis, Missouri
GRAVER TANK & MFG. CO., INC.
East Chicago, Indiana

Weldments (Steel Bases, Frames, Supporting Structures for Diesels)
BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

Wrenches
SNAP-ON TOOLS CORP.
8064 — 28th Ave.
Kenosha, Wis.

Wrenches, Box, Open End
SNAP-ON TOOLS CORP.
8064 — 28th Avenue
Kenosha, Wisconsin

Wrenches, Impact
CLECO DIVISION
REED ROLLER BIT COMPANY
P. O. Box 2119
Houston, Texas

Wrenches, Socket
SNAP-ON TOOLS CORP.
8064 — 28th Ave.
Kenosha, Wis.

Wrenches, Torque
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan
SNAP-ON TOOLS CORP.
8064 — 28th Ave.
Kenosha, Wis.

1953 Diesel Engine Prospects

(*Continued from page* 35)

related products—$10,518,000; lumber and wood products—$40,536,000; paper and allied products—$745,000,000; chemicals and allied products—$2,416,173,000; rubber products—$117,000,000; stone, clay, and glass products—$140,081,000. Thus, in general industry, the background is right for converting some of this spending to diesel sales.

Marine

In the Board's view, both Naval and private shipbuilding will expand in 1953. Among other factors, recognition is given to the Government's expansion goal for specified types of inland waterways vessels that has been set at 3923 vessels of all types. This goal does not apply to vessels designed for use exclusively on the Great Lakes, vessels procured by defense agencies, and vessels constructed or acquired for export. About 2000 craft of the types covered by the goal had been built between January 1, 1950 and mid-1952.

Potential growth of water transportation is indicated in proposed capital investment approved, totaling $114,325,000 for nearby foreign transportation; $34,500,000 for overseas foreign transportation; $11,553,000 for coastwise transportation; $107,924,000 for transportation on rivers and canals; $144,192,000 for Great Lakes transportation; $36,533,000 for towing and tugboat service; and $65,000 for ferries.

Petroleum

Here is another field of potential expansion for diesel power. Here also is one in which the Government has provided additional incentive for growth by approving rapid plant amortization. Approved certificates of necessity show proposed capital investment for crude petroleum and natural gas extraction and refining at $1,408,628,000 with another $509,764,000 approved for crude and refined petroleum pipe lines.

The 1953 potential demand for diesel engines in various segments of the petroleum industry is foreseen at 3850 engines, which would compare with 3525 units estimated as the final figure for the year 1952. It is anticipated that petroleum production in 1953 will increase from a capacity to produce 7,200,000 bbl. daily, to about 7,800,000 bbl.

Construction

The construction industry is an extremely important outlet for diesel engines. Increased demand for diesel-powered equipment will result from two major factors: greater construction volume; replacement requirements due to wear and tear on equipment in recent accelerated construction programs and the longer work periods resulting from shortage of equipment.

New construction expenditures for the full year 1952 are likely to exceed 32 billion dollars and be up about 5 per cent over 1951. A slightly lower volume of private outlay is being more than offset by a 25 per cent increase in public expenditures. By the end of 1953, the armament-period expansions should be over 90 per cent complete.

The longer future outlook for construction appears relatively favorable, despite the possibility of some let-down. Thus, public works, schools, hospitals, churches, recreational facilities, public utilities, sewers, and highways, are some of the projects counted on by the Board as likely to stimulate the aggregate volume of future construction and, of course, create a need for diesel-powered equipment.

Possibilities for highways alone are considered enormous. Increasing numbers of vehicles cause congestion and roads depreciate. The great financial successes of the new toll roads attest to the pressing need, in many cases at the crisis level. Outlay for highways, including toll roads and maintenance is expected to reach $2,700,000,000 in 1953 compared to about $2,450,000,000 spent in 1952.

Summing Up

A recapitulation of the figures given in the tables will show that realization of the full sales potential indicated for 1953 would bring an increase over the re-estimated 1952 figure of 18,655 engines, or 15.1 per cent.

In projecting the outlook for 1953, great stress has been laid on the proposed capital investment and the percentages of Government certification. This is the money that is proposed to be spent to attain expansion goals. In each case, diesels have a logical role. Their application may be direct or indirect and to varying degrees, but the potential is there. It is up to the diesel industry to aggressively take all steps necessary to insure maximum participation in this period of an expanding economy.

Maintaining Traction Motor Bearings

Outlining some problems and considerations encountered in the development of anti-friction bearings for application to traction motors in present-day diesel-electric locomotives. Also, their inspection and maintenance are covered.

*by F. S. Ball**

Transition from steam to diesel-electric locomotives on American railroads has been so rapid as to seem almost spectacular. To the public it was an apparently smooth substitution of one type of motive power for another.

However, back of the scenes, to railroad personnel responsible for handling details and to representatives of equipment-manufacturing companies who have contributed in some measure to the change, it has not been as easy and trouble-free as press releases might lead one to believe. There have been painful experiences, and sometimes discouraging moments, when some have been tempted to wonder whether the new equipment was worth all the headaches involved.

Bearing manufacturers are frank to admit that roller bearings on traction motor armature shafts were one of the potential sources of trouble. This is about what might have been expected, particularly now that we can look back at some of the conditions encountered and situations which had to be solved.

Armature Revolutions Per Mile Increase

Electric motors, both AC and DC, have been used to turn driving wheels of locomotives for some 45 years, with quite a range of wheel diameters and with a wide variety of driving mechanisms between the motor and wheels, varying from an arrangement with a jack shaft (from which power was transmitted to the wheel by connecting rods), to a gearless arrangement used on a Western road. One of the first major applications of non-friction traction motor bearings in the U.S. was made using SKF bearings on AC electric locomotives of an Eastern railroad. From the time of this application (1929) to date, changes in armature revolutions per mile are noted as steadily increasing.

With improvements in the electric motor, it was found more feasible to employ the axle-hung motor in the truck. This simplified maintenance as well as running gear design. However, locating motors between the wheels limited the space motors and armature bearings could occupy. Since loads and speed of these are of a high order, it is necessary that roller bearings be used on traction motor armature shafts. Without their use, development of traction motors to present power and efficiency would not have been possible.

Increased Capacity Necessary

Assuming the bearing loads to be approximately the same, it was necessary, on the basis of increase in traction motor armature revolutions per mile, to provide bearing capacity of latest locomotives three times that required in 1929 to obtain the same life in miles.

Another factor is that in 1929 annual mileage of 125,000 was considered high, while today, modern diesel-electric locomotives on high speed passenger long distance runs make from 250,000 to 300,000 miles per year. Bearings are expected to give a reasonable length of life in time as well as in mileage.

Extension of inspection cycles and motor overhaul periods require that bearing manufacturers keep pace so that bearing will run at least from one motor overhaul period to the next. Lubrication (covered later) has a great deal to do with success of this aim.

Bearing Types

Pinion end bearing is shown in Figures *1* and *1a*. Rollers move between two vertical flanges which are an integral part of outer race. The inner race is a straight sleeve beveled at one end on inside bore to facilitate mounting. The cage or retainer is a bronze alloy ring which retains the rollers in their proper position.

Commutator end bearing is shown in Figures *2* and *2a*. The outer race and roller assembly of this type bearing are similar to that used in the pinion end location. On the inner race, an integral flange is provided on one end. On the other end a removable thrust collar, or stabilizing ring, limits the axial displacement of inner race.

Pinion end bearings are commonly referred to as "free" bearings, while the commutator end bearings are normally termed "held" or "fixed" bearings. This combination of "held" and "free" arrangements allow for the linear freedom of the armature shaft for thermal expansion.

Design Considerations

In a normal traction motor application, the load is applied in a direction dictated by the contact angle between pinion and gear teeth. A zone of approximately 150 deg around the bearing carries the load. It is known, from actual measurements as well as theoretical calculations,

**The author represents SKF Industries, Inc. The article is based on the text of a talk delivered by the author to the Southwestern Railway Diesel Club.*

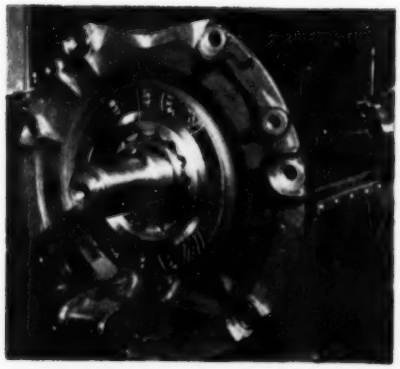


Fig. 1 (far left) Pinion-end bearing with end-housing cover removed.

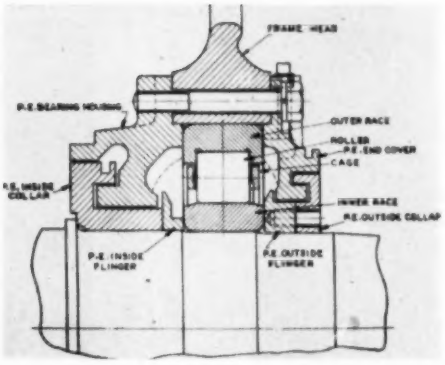


Fig. 1a (left) Cross-section of pinion-end bearing showing details.

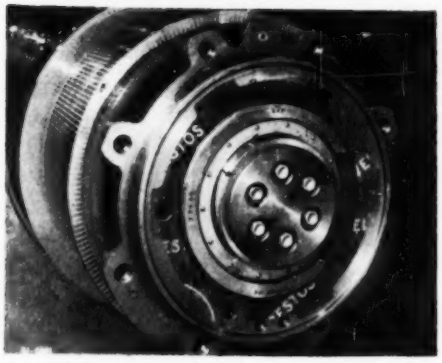


Fig 2 Commutator-end bearing as seen with the bearing housing cover removed.

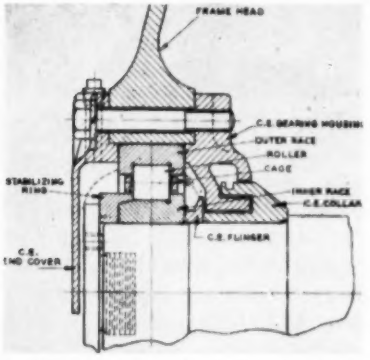


Fig. 2a Cross-section of commutator-end bearing showing mounting details.

Fig. 3 Washing tank demonstration at a school session

that the rollers and races in the load zone deflect under load—a small but measurable amount. As the rollers pass through the loaded area, a succession of deflections takes place, both on the surfaces of the races and the rollers, so that in this movement a complete reversal of stress occurs on these parts. This action therefore is similar to that in a fatigue-testing machine.

As early as 1873, Dr. Hertz, an eminent European physicist, developed formulas for the calculation of deflection, as well as for the calculation of stress imposed on material during the rotation of rolling elements. The Hertzian stress formulas, until quite recently, defied rationalization with test results. However, improvements in the science of theoretical stress analyzation have given a very close correlation with actual laboratory experience.

Very early in the development work, in the design of anti-friction bearings, it was found that a wide variation of bearing life could be obtained, even when operated under very positively controlled conditions. This dispersion between maximum and minimum lives, obtained from apparently identical bearings, occurred in spite of the most scientific methods of controlling the manufacture of the material, its heat treatment, and processing into the finished bearing.

As these failures, especially when observed under controlled conditions, all exhibit the same characteristics, a theory has been evolved which holds metal fatigue responsible for failures. Metal fatigue is a condition which affects any piece of metal when subjected to reversal of stresses. This condition is not new, it used to be called crystallization. Crystalline appearance is due to a fracture crossing grain boundaries.

The fatigue phenomenon has not received its full share of attention by scientific investigators. Certain fundamental facts are known and have been repeatedly verified by investigation. However, to date, no practical method has been devised whereby a piece of steel can be analyzed with results that will give any indication of the potential fatigue endurance of that particular piece or pieces made at the same time under identical processes.

While this may seem to be an unusual condition, it should be realized that many common objects used in industry fail from fatigue. The lives obtained may vary widely, even though excellent manufacturing controls are exercised. Much investigation is being conducted by many research laboratories throughout the world, and it is hoped that at some time in the near future more scientific methods will be available to aid in solving this problem.

Life Expectancy

In the bearing industry, however, it was determined by Stribeck of Germany, as early as 1905, that one approach which was at least realistic, was the inauguration of a large series of endurance tests.

Much of what is known about bearing life has been determined by this method. In short, a group of bearings manufactured under as nearly as possible the same conditions and made of steel from the same heat, heat treated

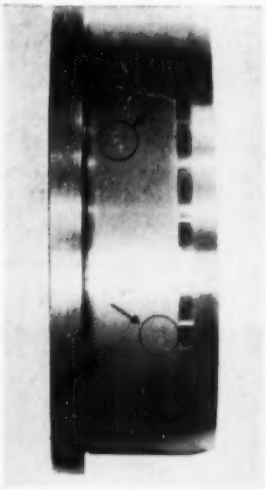


Fig. 4 Two concentrations of electric pitting are indicated on this inner race.

Fig. 5 Most severe denting marks are circled. Balance of area is more lightly marked.

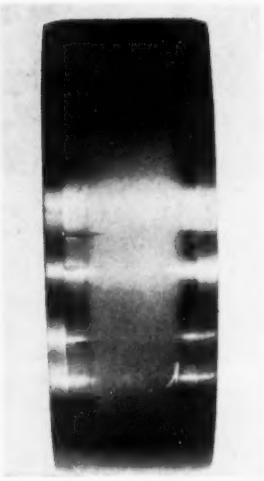


Fig. 6 An inner bearing race showing the characteristic marks of scoring.

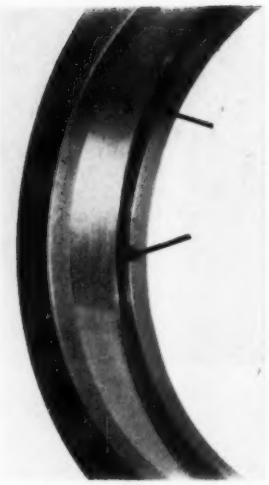


Fig. 7 Arrows show typical smear markings. Less evident is roughened area resulting.

at the same time, are placed in testing machines and operated until failure.

Failures are then carefully analyzed to determine the actual cause. The results of thousands of these tests have given an indication of what must be done, both from a metallurgical and manufacturing point of view, to produce bearings having a high fatigue resistance. It is interesting to note that because of the wide dispersion in lives obtained with anti-friction bearings, special mathematical methods have to be employed in the study of these results. This is commonly known as statistical analysis of property retirement, and is the same basic branch of mathematics used by life insurance actuaries.

For practical engineering purposes it was decided to adopt a point on the dispersion curve for the design criterion. This point, commonly referred to as minimum life, or 10 per cent failure life, was selected for the basing point of all SKF recommendations. In this way, it can be said with some degree of accuracy that 90 per cent of the bearings used will operate for this life without danger of fatigue failure. Actually the majority of this 90 per cent will operate for a considerably longer time—the average of the whole group is approximately 1½ times the 10 per cent failure life.

Shortly before World War II, steps were taken to incorporate major improvements in the design of cylindrical roller bearings, through the use of the so-called "crowned" roller. This development was the result of years of experience with aircraft engine designers who place great emphasis on the reduction of unnecessary weight. It was imperative to devise a means of developing the most capacity within a given space.

It was found, through elaborate laboratory investigations, that improvement in bearing capacity could be obtained without change to the bearing races, if the rollers were slightly crowned at each end. This was done to eliminate the development of stress concentrations at the edge of roller paths due to the so-called edge effect. The distribution of stress at the line of contact between two true cylinders is not uniform along the entire length of that contact. Instead, due to the edge effect, a rather high concentration takes place at each end which leads to early fatigue failure at these points due to stress intensity.

Increase of the corner radii at the roller ends brings about no reduction in this concentration of stress; it merely moves its location inward. This results in a drastic reduction in the actual load carrying capacity.

With crowning, the roller is first ground cylindrical. Then each end is ground on a long arc, which results in a combination surface of two arcs separated by a cylindrical flat. The effectiveness of this arrangement is readily recognized as it can be easily shown that with an increase in load, the area of contact is gradually increased. But the maximum stress is located at points well placed toward the center of race.

Crowning of both races theoretically will achieve the same result. The advantage of crowning rollers rather than races is realized in the manufacturing of these parts, as measurements in the control of this operation are more susceptible to accurate repetition.

With a view toward obtaining a greater bearing carrying capacity, within a given sectional area, the internal design of the entire bearing was reviewed. Again, guided by aircraft experience and also by experience with other applications, it was found that the standard ring thickness proportion, established many years ago, could be reduced without affecting fatigue life.

With this knowledge at hand it was possible to increase the size of the rollers and thereby increase the specific capacity of bearing. Ring section in the new bearings is still within the safe limit for strength. No proportions were established without having been thoroughly tested in actual service.

In the new bearing, fourteen 41- by 43-mm rollers are used as compared with fourteen 38- by 38-mm rollers used in the old standard bearing. This change in roller com-

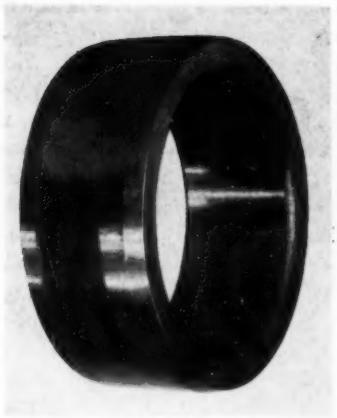


Fig. 8 Shift of track resulting from improper mounting.

Fig. 9 Typical appearance of loss of metal due to fatigue failure.

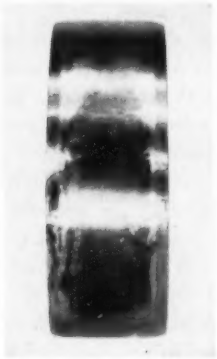


Fig. 10 Discoloration caused by excessive bearing temperature.

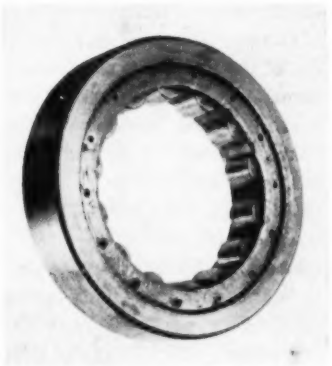


Fig. 11 Inadequate lubrication was responsible for the dilapidated condition of this bearing.

plement results in an 18 per cent increase in radial capacity and approximately double-life expectancy over the old standard bearing.

There are a substantial number of these bearings in service on railroads throughout the United States. So far, maximum mileage has been approximately 300,000 miles, and none of these bearings failed from fatigue.

Inspection and Maintenance

Inspection normally is necessary only at time of motor overhaul. It is recommended that bearings be removed at shopping periods and carefully inspected before re-application. The importance of this inspection cannot be overstressed and to facilitate this work SKF has provided the following services:

1. A Bearing Inspection Service—under which bearings can be returned to the factory to be given a thorough inspection. Any parts which have been damaged or show signs of eventual failure are replaced with new material. The bearings are than returned to the railroad and given the same guarantee against defects in material and workmanship as new bearings. A moderate charge is made for this work and the time consumed is about six weeks.

2. A Traction Motor School—to assist the railroads in training personnel to make these inspections in their own shops. These school sessions are held at regular intervals at SKF's Philadelphia plant, or at some convenient location in the field. Instruction covers work and equipment necessary to clean and inspect bearings. The men are trained to recognize common types of troubles and to distinguish between serviceable and non-serviceable bearings. This manufacturer also maintains a staff of trained service engineers who make periodic calls on railroad shops to further assist shop personnel in properly setting up their inspection procedures.

While intermediate inspections can be made safely in the railroad shops, it is recommended that after the third overhaul, approximately 1 million miles, bearings be returned to the factory for a regular factory inspection.

After removal of bearing parts, cleaning is the first step in bearing examination. This involves removal of accumulated grease and dirt from races and between rollers and cages. A number of different methods can be used, such as washing the bearing in a tank filled with Safti-sol, or if more elaborate equipment is available, either the Agitex method or dimithel chlorine degreasers can be used. The tank method, the most expensive of those mentioned, is illustrated in Fig. 3.

The important part of hand-washing is the rotation of the roller set. This carries the solvent up into the cage and permits it to soften and wash out the accumulation of grease which is otherwise out of reach. Inner races of cylindrical bearings need only a dip in the solvent and a good wiping to be cleaned thoroughly.

Close inspection of inner race is the next step. Under a good light, look first at the roller path for flaking or cracks. Either of these two defects are sufficient justification for rejection. Examine also for pitting, signs of excessive wear, or dirt denting.

Electric pitting is caused by the passing of electric current between the rollers and one or both races. Most frequent cause for electric pitting of bearings is motor flashover. The arc actually burns a small crater into the race or roller and can occur with low voltage and amperage currents. These pits, if well scattered, are not serious but should be considered carefully if any of the craters are raised around the edges. If so, they should be stoned off before the bearing is returned to service. It is adviseable to reject the bearing if pitting is concentrated.

Dirt denting in excessive amounts should be carefully noted as this may indicate outer race flaking. If a mottled but uniformly distributed pattern of denting is present on inner race and rollers, there is a possibility that the outer race has spalled or flaked. The bearing should then be scrapped or returned for factory examination.

Side surfaces and bore of inner race should next be scrutinized for evidence of rubbing or turning on shaft. If the bore shows evidence of a good tight fit on shaft, but one or both side surfaces of race show signs of rubbing, the spacers and enclosures of the housing assembly should be examined for interference which would cause those parts to turn on shaft. Heavy rubbing of side surfaces of race as well as indications of rotation on shaft are causes for rejection.

Fig. 12 "False Brinelling" or "fretting corrosion" occurs through vibration when not operating.

Fig. 13 Broken bearing inner race and smearing on the "H" piece.

On commutator end bearing, look also for smearing on flange and thrust collar. If smearing is present on the race, the roller ends will also show the same indications and will exhibit wear at the contact area.

Smearing is, as a rule, caused by inadequate lubrication. But if smearing extends to only part of the circumference of race flange, this is good evidence that the outer race was cocked in the housing during original assembly. Out of squareness will be further shown by a displacement of roller contact on inner race. The outer race roller path cannot be seen without disassembling the cage, which is a job for the factory. However, if careful attention is paid to all signs, a good indication of condition of outer race can be obtained.

Examination of roller assembly in cage and outer race should start with rollers. These can be rotated with the fingers, exposing all surfaces. Heavy denting generally indicates a flaked race which should not be returned to service without factory examination.

Generally, there will be found a series of circumferential bands on the rollers which will not be uniform on all of the roller set. These bands will be highly polished, varying in width, and will be markedly in contrast to the outer surfaces of rollers. This condition is not serious, as it is caused merely by particles of dirt becoming embedded in the cage bar and acting as lapping material. Frequently these bands are very narrow, resembling circumferential cracks, but close examination under a magnifying glass will reveal their true character.

Condition of outer race roller path can be further checked by holding one roller between thumb and forefinger and sliding roller around race. Large flaked areas can thereby be detected by feeling the drag as the roller is slid over the flaked area.

Evidence of outer race spinning in housing will be revealed by condition of outside diameter surface. If such indication is present some step to improve fit in housing should be taken, such as building up by welding, or bushing frame head and re-boring to correct diameter. If outer race is worn on outer diameter, it is recommended that bearing be scrapped rather than to make up an undersize housing. Later application of a standard OD bearing to such an undersized housing would have too tight a fit and might lead to future difficulties.

Cages should be carefully examined for wear. With outer race and roller assembly in a vertical position, cage can be raised and lowered to check clearance. Further, if excessive wear has occurred, a thin edge turned up by the rollers on each cage bar will always be present. Small amounts of wear on cage are not detrimental, but as this condition is generally caused by inadequate lubrication. other parts of the bearing will show evidence of this condition as well, warranting rejection of the whole bearing.

After examination, if bearing is satisfactory for continued service, the whole bearing should be dipped in a slushing oil and wrapped in clean rags. If not to be reapplied for some time, the assembly should be placed in a dustproof container for storage in a clean dry place. If these precautions are taken, no further washing or cleaning is necessary before reapplication.

Fatigue flaking is evidenced by a shelling or flaking out of the surface. It may occur on the roller paths of both races and on the rollers. When this defect is found, the bearing should be removed from service as the part that flaked has reached the end of it fatigue life. If the flaking has not progressed far enough to affect the other parts of the bearing, these parts can be salvaged by the manufacturer. Replacement of the flaked part can be made and the remainder of bearing parts put in serviceable condition. It has been found that bearings so reclaimed will give outstanding performance after reconditioning, and in many cases will perform as well as a new bearing.

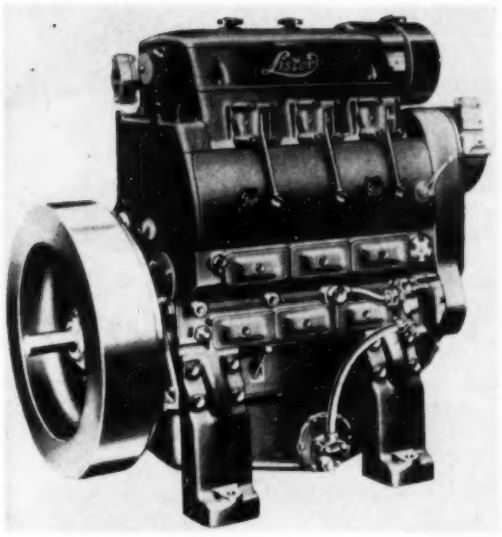
Corrosion or corrosion pitting is caused by moisture or some other corrosion agent which attacks surface of bearings. As in the case of electric action, if pits are widely scattered, bearings can be continued in use.

Some well-known railroad authorities claim that many failures of traction motor bearings are due to misalignment of bearing housings. This, in some cases, may be caused by distortion of structurally weak motor frames when under load. When distortion takes place, the running clearance of the bearings are taken up, resulting in shortened bearing life and failures.

Summary

The sum total of the bearing manufacturer's engineering skill in design, in precision manufacturing operations, and of his service engineering information, is the background which enables him almost unfailingly to recommend the most suitable bearing for each application. But all this means that full bearing life will be obtained only if the user of the equipment on which bearings are installed gives proper care to maintenance and lubrication.

Lubrication recommendations of equipment builder should be followed closely; they represent the accumulated experience of the industry. If oil is used, renewal periods should be closely controlled, and oiling arrangement checked to make sure that it will furnish adequate supply until next period, and that dirt does not get into bearing. If grease is used, the brand and type recommended by motor manufacturer should be used.



National Supply's Lister Diesels

Recently, National Supply became the sole distributor within continental United States for the diesels manufactured by R. A. Lister & Co., Ltd., of Great Britain. Design features of the new "Freedom Range" engines are given.

DEVELOPMENT of the FR line of engines started prior to World War II. They were specially designed for operation at medium high speeds and for reliable operation at temperatures ranging from the tropic to the arctic. To facilitate their production, the Lister plant was extensively reorganized with much new equipment being installed.

The engines are made in 1, 2, 3, 4, and 6-cyl models ranging from 8 to 54 hp. The single cylinder model is rated 8 hp at 1500 rpm, while all others develop 9 hp per cyl at 1800 rpm. Bore and stroke are 3¾ by 4½ in.

Attention was given to weight reduction with the result that the FR's weigh approximately half that of the earlier Listers of equivalent horsepower. Although totally enclosed to give protection to the working parts, all of the covers are easily removable for accessibility.

Some Design Features

In spite of appreciable weight reduction, the engines are rugged. The crankshaft, connecting rods and the bearings are very large for the engine sizes and speeds. The same is true of the camshaft.

The wet-type liners feature the patented Listard chrome-hardening process. With this electro-chemical process the cylinder surfaces are permanently impregnated with chromium that is bonded into the bores of the cast iron. It is said that the chromium cannot peel off or become detached and it certainly produces a wearing surface with excellent resistance to corrosion, erosion and wear.

Lubrication is provided by a gear-type pump, mounted externally for accessibility. Although mounted above the oil level in the sump, special provision is made to provide instantaneous priming. An oil strainer, removable as a unit, is located in the sump and when removed, provides a large hand hole for sump cleaning. When necessary the entire sump can be easily removed for access to all crankshaft bearings.

Scavenging and Combustion

A high capacity air cleaner gives the incoming air a swirl and centrifugal action along with suitable baffles directs foreign particles to an oil-filled trough. A patented Lister air silencer quiets any intake noises.

The Lister dual combustion chamber is used. There is a pre-combustion or swirl chamber and an auxiliary chamber. A spring-loaded lever arrangement permits the auxiliary chamber to be isolated from the precombustion chamber with the result that high compression can be obtained for ease in starting, even in cold climates. Release of the mechanism lowers the compression ratio again to the lowest practical ratio for normal engine operation.

The system will operate at the higher compression ratio with clean exhaust throughout the entire load range. This insures a means of providing the additional heat required for complete fuel combustion under all varied load conditions.

Individual fuel injection pumps are used for each cylinder. This was done in the interest of standardization so that all pumps on all FR engines are interchangeable. A centrifugal-type governor maintains "settled" speed variations within 2 per cent, while a fully automatic release limits overloading to 10 per cent.

A built-in Lister fuel filter, wound in spiral form in a special container, is housed in a settling chamber forming part of the crankcase. Removal and cleaning of the element is a simple process.

Parts Availability

Engine units will be shipped to the United States less such units as starters, generators, radiators, clutches, marine gears, etc. American accessories will be used, thus assuring availability. Standard items and engine parts will be stocked by the National Supply Engine Division branches and dealers.

Straight from the Tool Box

This is YOUR Department. Pass along your ideas to the other fellow. Send items to the Editor, preferably with a picture or sketch. Contributors will receive $10.00 for each item upon publication.

Pins and Springs

WALTER K. HYRE, SEATTLE, WASH.—I go to Alaska in the summer as Port Engineer for a salmon cannery and we are often required to do some "queer stunts". One that I would like to pass along concerns shrink-fit pins in expensive castings. Sometimes a pin will be a little loose and no oversize pin is available. Yet a repair must be made. It can be done—and a good job, too—by first warming the casting so that it expands a little. Next, wipe a thin layer of lapping compound on the pin and tap it into place. That's all.

Don't worry about the pin coming out; in fact, this suggestion should only be used in emergency as the pin will be very difficult to remove later. I have repaired several marine reverse gear drums in this manner. The fishermen were grateful and the jobs lasted for years.

Another thing that we frequently have to do is to make springs for various purposes. A pretty good spring can be made in emergencies by a very simple method. Of course, you must have some spring or piano wire of about the right diameter.

Next, get yourself a length of metal rod with an OD that is the same as the ID of the desired spring. Bend this rod into the shape of a crank, leaving one long end. Cut a slot in the end of this length with a hacksaw. Place the long end of the rod, crank protruding, between two pieces of board (plywood or hard-wood if available).

Now, place the end of the wire in the slot and turn the crank. This will wind a tight pull spring without any attention to feeding. If a compression spring is wanted, the spring will have to be stretched.

Mr. Hyre always is good for some practical ideas. We will go along that general-purpose springs can be made this way, but don't try it for valve springs, etc.—Editor.

Eye Safety Shield

FLOYD BORMAN, ENTERPRISE, OREGON—Here is a little kink that I have used to good advantage both for safety and to speed up the work.

It frequently becomes necessary for me to work underneath a truck or other machine that has just gotten in from working in mud and has not yet been cleaned. Needless to say, dirt was forever falling in my eyes. Now, I am using a clear-vision grinding shield for eye protection while I keep right on with the job until done.

The fact that I can keep working under such conditions has made money for me and also the truck or machine owners. This little trick also proves successful when drilling holes directly overhead.

This simple stunt might well be picked up as a safety precaution to be enforced along with the use of such shields in grinding operations.—Editor

Taming Elusive Gaskets

JOHN B. BAKER, NIMMITABEL, N.S.W., AUSTRALIA—I have come across a short cut in reference to tractor service work that I want to pass along.

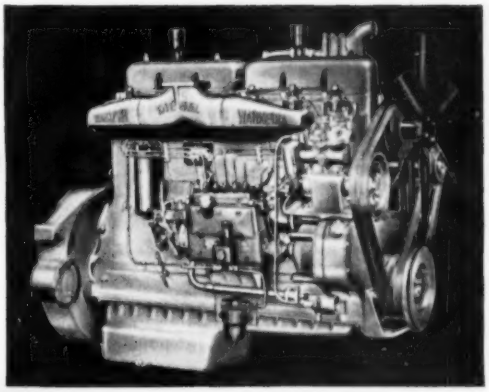
When fitting Caterpillar D-4, and the old model D-6, transmission top cork gaskets, the first step is thoroughly to clean the groove and adjacent area with gasoline to remove all traces of grease and oil. We steam the cork gasket thoroughly so that it will adapt itself to the casting contours.

The next step is to secure the gasket in place using about 12 6-in lengths of transparent cellulose tape. This tape holds the gasket in its correct location when the cover is fitted to the transmission top.

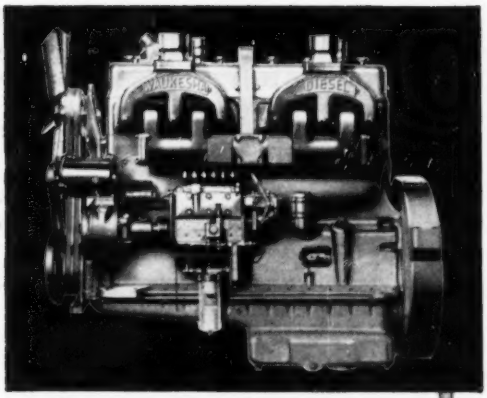
Results have proved that the cork is kept in place and that an oil-tight seal is assured. This process may be adapted to most other gaskets, but in most other cases where the gaskets are retained better, it is easier to just grease the gasket and casting surface.

Sounds like a good idea for all of those hard-to-keep-in-place gaskets, particularly where there are holes for oil passages, etc., that must be lined up.—Editor

WAUKESHA Diesels ...FOR FAST HEAVY HAULS



148-DK High-Duty DIESEL
six cylinders, 5¼-in. x 6-in.,
779 cu. in. displacement,
peak horsepower 200.
Get Bulletin 1532.



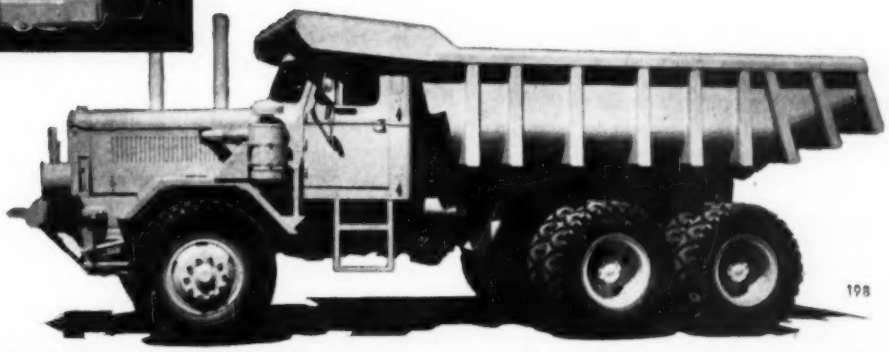
WAKD Super-Duty DIESEL
six cylinders, 6¼-in. x 6½-in.,
1197 cu. in. displacement,
peak horsepower 225.
Get Bulletin 1415.

CROSS COUNTRY

where the pay-off is on payload—you'll make more miles and cut costs too, with this modern feature-packed truckers' Diesel—High-Duty Waukesha 148-DK.

OFF THE HIGHWAY

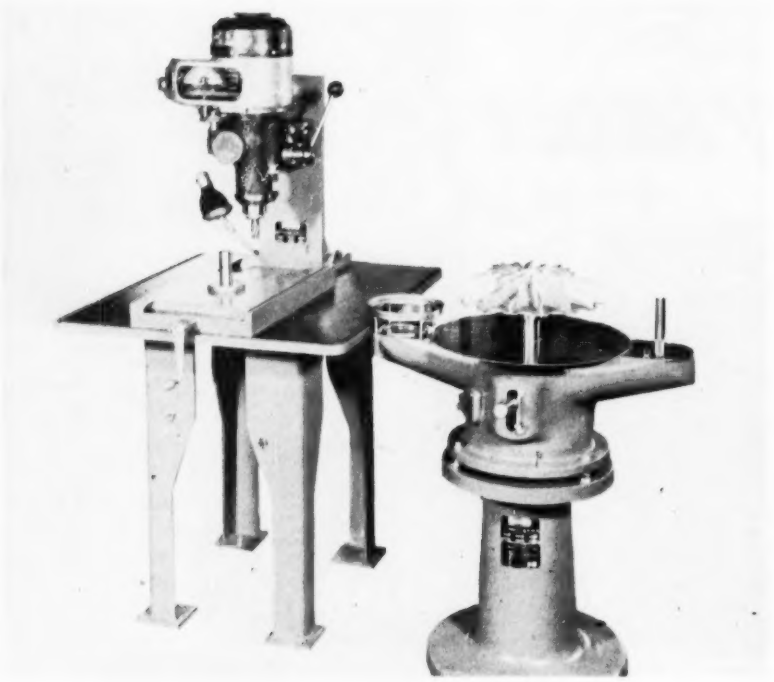
in and out . . . down and up . . . over and through . . . go the trucks with Waukeshas—Super-Duty Six Diesels putting out the power that pulls and pays.



198

WAUKESHA MOTOR COMPANY • WAUKESHA, WIS. • NEW YORK • TULSA • LOS ANGELES

New Products



Corrective Balancing Device

In production by the Taylor Dynamometer & Machine Co., Milwaukee manufacturers, is a simplified and inexpensive unit for milling operations required to make corrections on piece parts that are to be put in balance.

The arrangement consists of a milling attachment mounted on a ground work table with coolant trough. The fixture for the piece part to be corrected is mounted on ways and moved against an end mill in the milling attachment. A manual feed screw with a graduated color for measurement of stock removal provides for a quick and simple operation. Developed because of a long-standing demand for simplified correction where removal of weight is required and drilling is not feasible, it is designed for use with the manufacturer's "Hi-Eff" balancing machines.

Electric Vapor Degreaser

J. D. Wallace & Co., 136 S. California Ave., Chicago 12, Ill., announces the DG-1 degreaser, a production unit, portable and thermostatically controlled. Provided with either a 110- or 220-v heating element, it is ready for instant plug-in operation. Heat-up time is less than 20 min and requires only 2½ gal of solvent.

The manufacturer's non-inflammable Xsol solvent vaporizes at high moisture-dispelling temperature, and coupled with a hot-dip galvanized steel tank, it is claimed, practically eliminates rusting and corrosion problems. Provision is made for easy attachment of a flusher pump, lip vent, 21-in diam work baskets, and other accessories required on some degreasing applications.

Torque Trainer-Testers

Development of two new torque trainer-testers for testing all size torque wrenches has been announced by B. K. Sweeney Mfg. Co., 1601 23rd St., Denver, Colo. The testers provide a visual means of gauging torque accuracy and permit quick check of a torque wrench, automatically teaching the proper way to apply force. The new models are said to be faster to operate and are guaranteed to be accurate within two per cent full scale reading.

Model 71 is designed for heavy duty torque wrenches calibrated in ft-lb having a range from 0 to 350. Model 73 accommodates all standard duty wrenches and is calibrated in in-lb, ranging from 0 to 1200. Both are designed for wall mounting, and are being used by railroads, shipyards, and diesel maintenance shops.

New 30-Ton Lorain Cranes

A 30-ton lifting capacity machine is now available in two models from the Thew Shovel Co., Lorain, Ohio.

The Moto-Crane model MC-524 is mounted on an automotive type 3-axle carrier having 10 speeds forward and 2 reverse. It can travel at speeds up to 30 mph and has double rear axle bogies and tractive effort to enable it to go over soft ground and rough terrain. A diesel power plant is available, and the model is convertible to shovel, clamshell, dragline, or hoe, rated in the 1 cu yd class as a shovel.

The Self-Propelled model Sp-524 is built for more limited travel needs, mounted on a 3-axle carrier propelled by a turntable engine which is available for diesel. Drive is two rear axles only with four speeds in both directions up to 7½ mph. It is available as a crane and dragline only.

Corrosion-Resistant Alloys

The Aluminum Co. of America, 801 Gulf Bldg., Pittsburgh 19, Pa., announces two alloys, highly resistant to corrosion, which are designed for use in welded assemblies, tanks, and highway transportation equipment. The alloys, designated XA54S and

XC56S, permit use of section thicknesses approximately one-half or less of other aluminum alloys commonly used for similar purposes.

XA54S belongs to the aluminum-magnesium alloy family and has mechanical properties between those of 52S and 56S. Sheet and plate are available in the annealed and intermediate work-hardened tempers. XC56S is similar to the 56S alloy used for wire products, except that the composition has been altered to improve its welding characteristics. It is for general use in the annealed (-0) and hot rolled (-H112) tempers.

New Fiber Glass Safety Hat

The U. S. Safety Service Co., 1215 McGee St., Kansas City, Mo., is manufacturing a new safety hat which it claims lasts longer, while still light in weight, and is comfortable to wear. It is made of fiber glass a resilient

material which will not split, crack or deform.

The manufacturers state that it meets the ASA code for dielectric breakdown and exceeds the code for impact resistance. Cradle of the hat can be easily adjusted to fit all head sizes and complies with federal specifications.

Multi-Purpose Lithium Grease

Exceptionally high resistance to breakdown is claimed for Shell Alvania grease, a lithium base product ready for marketing by the Shell Oil Co., 50 W. 50 St., New York 20, N.Y. Other properties combining to make multi-purpose application possible are its high water tolerance, its broad temperature range, its low rate of oxidation, and its excellent storage stability.

Savings announced to be possible by combining these properties in one type of grease are reduced grease consumption, elimination of misapplication, reduced inventory, more simplified storage and purchasing, and reduced downtime. Because it stays in bearings longer, relubrication periods can be extended.

New Motor Pump, Valve

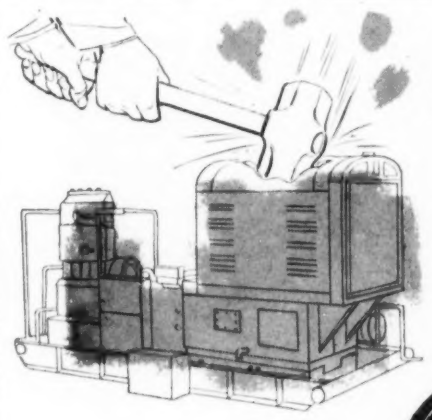
The John S. Barnes Corp., 128 Walnut St., Rockford, Ill., has introduced two new products, a rotary gear pump and a single solenoid 4-way valve.

The pump is a compact unit designed for fluid transfer, lubrication, power tools, etc. A complete line is available from ¼ hp to 1½ hp with pump capacity ranging from 60 to 360 gal per hr. It weighs approximately 35 lb.

The valve is manifold mounted for continuous duty and has a maximum flow of 3½ gal per min with a maximum pressure of 1000 psi.

Paint-On Solder Paste-Flux

A new paint-on solder paste combined with flux has been released by Eutectic Welding Alloys Corp., 40-40 172 St., Flushing, N.Y. The product, which can also be used as a tinning compound in paste form for all tin-



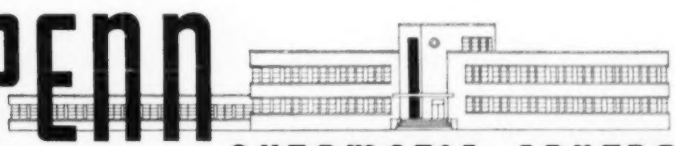
IT CAN HAPPEN to your engine!

No one will swing a sledge hammer on your engine *but* here's something just as destructive. Oil pressure failure or overheated cooling water can develop even in the best engine . . . and create serious damage and costly repairs!

That's why *your* engines should be protected by PENN Safety Controls. Then, if water temperature becomes overheated . . . or if oil pressure falls too low . . . the PENN control goes into action! Automatically, it sounds an alarm, flashes a warning light or stops engine operation . . . whichever you choose. The minor trouble then can be investigated and corrected before serious damage develops.

Learn more about this *low-cost* protection for *new and old engines.* Write **Penn Controls, Inc., Goshen, Ind.** Export Division: 13 E. 40th Street, New York 16, N. Y., U.S.A. In Canada: Penn Controls Limited, Toronto, Ontario.

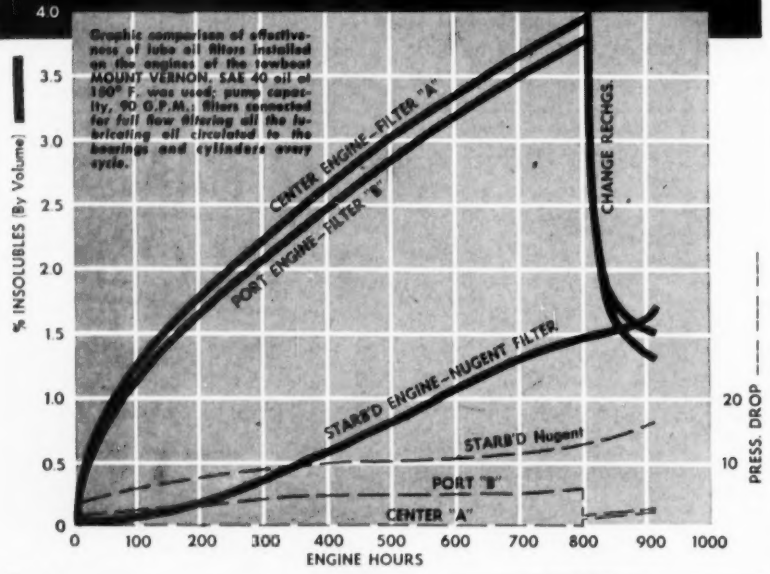
PENN



AUTOMATIC CONTROLS

FOR HEATING, REFRIGERATION, AIR CONDITIONING, GAS APPLIANCES, PUMPS, AIR COMPRESSORS, ENGINES

Side-by-side Comparison
under operating conditions proves the superiority of NUGENT Filters



IN order to unquestionably determine the relative effectiveness of three leading lube oil filters, the owners of the towboat, MOUNT VERNON, installed a different make of filter on each of the boat's three identical engines. At regular intervals for 800 engine hours, the cleanliness of the oil was checked and recorded. The graph above shows the results—at the end of 800 hours the oil that was Nugent filtered contained less than half the concentration of insolubles as the more effective of the other two filters. Note, too, that oil passing through the other two filters was dirtier in 200 hours than the Nugent filtered oil was at the end of 800 hours.

Nugent filtering will give you this effectiveness, too. It will add to the life of your engines by reducing the amount of harmful impurities that reach vital working parts. It will extend the life of lube oil by keeping it cleaner longer.

For full information on how Nugent filtering can help you, write, outlining your filtering problem. Descriptive literature on Nugent filters is also available on request.

Nugent filter of the type used in the test aboard the MOUNT VERNON.

Wm. W. Nugent & Co., Inc.
417 N. Hermitage Ave. CHICAGO 22, ILLINOIS

OIL FILTERS, OILING AND FILTERING SYSTEMS, TELESCOPIC OILERS, OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS

Established 1897

Representatives in Boston • Cincinnati • Detroit • Houston • La Jolla, Calif. • Los Angeles • Minneapolis • New Orleans • New York • Philadelphia • Portland, Ore. • San Francisco • Seattle • St. Louis • Tulsa • Representation in Canada: Montreal • Toronto • Vancouver

ning operations, is claimed to be ideal for production and repair items and for intricate parts where conventional methods are impractical. It can be used with torch, furnace, or soldering iron to join all metal except aluminum and magnesium.

Basically, the formulation consists of a lead-tin-solder that is pre-mixed in paste form in proper proportions with its specially compounded accompanying flux. The result is said to yield a capillary flow similar to silver solder, with strengths equal to conventional lead-tin solders, while eliminating waste involved in melting solder off a stick in the ordinary way. Any flux residue resulting from application can be washed off with plain water, preventing corrosion.

One-Man Diesel Jack

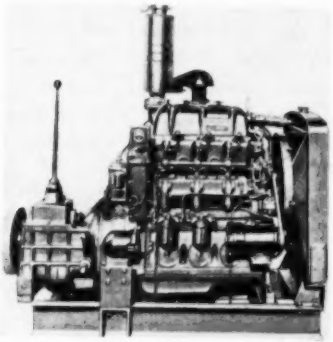
The Joyce-Cridland Co., Dayton 3, Ohio, announces the addition of a new diesel locomotive jack to its line of railroad jacks. The result of three years engineering, model 35-HL weighs 1/3 less than existing jacks with the same lifting capacity. It can be moved and operated by one man.

Weight reduction has been accomplished by use of aluminum alloys throughout the framework. Internal working mechanism and gearing is constructed of high alloy steel precision machine parts. All motor parts and intermediate gears are interchangeable with standard Joyce air operated jacks.

Total weight of the unit is 1255 lb. It has a 35 ton lifting capacity with a 4-ft, 4½-in rise and can be used in lifting engines, freight cars, passenger cars and diners.

New Diesel Power-Package

Harnischfeger Corp., Diesel Engine Div., Crystal Lake, Illinois, is presenting the P&H diesel power-package, a complete power unit that is engineered for simple installation in any make of



shovel. It is built around the company's model 387-C, 2-cycle, 3-cyl diesel engine of 60 hp.

Included in the power package is the equipment required for shovel installation: mounting brackets to fit original engine bed, necessary controls and power connections, and reduction gear, if needed. Simplified maintenance and greater accessability are claimed; the patented cylinder head and liner assembly can be replaced as a unit in less than 1 hr. Replacement can be made in the field without necessity of dropping the oil pan.

New Plug-In Alarm System

A new type of plug-in annunciator system incorporating complete interchangeability of circuits and functions, has been announced by Panalarm Products, Inc., Chicago 40, Ill. A single standard Panalarm can be used to signal any off-normal condition throughout a plant.

Used either as running or trouble signals, the system provides both an audible and a visual alert that must be acknowledged by the operator when off-normal condition develops. Changes of circuits, operating sequences, or forms, are made by connections on an enclosed terminal block mounted on the rear of the cabinet. Standard stock systems are available providing for 3 to 54 individual signals operating with a common horn and acknowledgement push-button.

MAINTENANCE REPORT

HOW MUCH
SPRING TENSION IS LOST
When You Grind Valves & Seats?

"EXPERT MAINTENANCE MEN KNOW" . . . says "Pete" Peterson, "that on one engine you lose up to 25% valve spring tension (valve in closed position) when the pressed-in valve seat is lowered as little as 3½ thousandths. Loss of spring tension causes broken or burned valves because valve flutters and bounces on a hard, distorted and cocked pressed-in valve seat.

DO YOU KNOW . . . ? That when using *pressed-in seats* (pre-cut 45°) you can't get the correct valve seat height because:

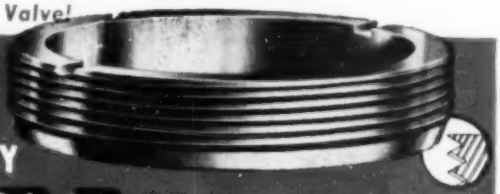
1. The pre-finished valve seat insert drops below block surface when pressed into a deepened counterbore. You necessarily deepen the counterbore when you clean and true it up.

2. *Pressing in* an insert distorts the valve seat which then requires considerable grinding to get it back to round. With excessive grinding you again lower the seat.

Both "truing up" processes set the valve seat lower in the block than called for in original factory specifications . . . the result, decreased spring tension and ultimate valve breakage and burning.

Stays Round—Cools Valve!

Made of tough chrome-nickel-iron, individually cast under pressure. Unlike pressed-in seats, P-B Screw-In Valve Seats retain their original dimensions, won't buckle and come loose, can't tilt and cause hot spots and valve burning, and allow for perfect seating of valve on every stroke.



ONLY THE P-B SCREW-IN VALVE SEAT
WITH EXPANSION CLEARANCE

P-B drill press unit for production installation. Also available HEAVY DUTY PORTABLE unit for jobs in or out of chassis—up to Diesel locomotives.

Special 8 and 12 fluted CUTTER and TAP makes only precision counterbore in replacement field and machines in expansion clearance between threads.

SCREW-IN SEAT WITH EXPANSION CLEARANCE

LET'S YOU HOLD
FACTORY TOLERANCES
ON VALVE SEAT REPLACEMENTS!

1. With P-B seats you can get exactly the right valve seat height even though you deepen the counterbore. P-B seats have an extra 1/16" of material which is easily machined off flush with block. And since the P-B seat is *not* pre-cut, you can grind to factory accuracy.

2. Because you *screw-in* the P-B insert there is absolutely *no* distortion . . . the seat remains perfectly round.

P-B's exclusive features let you hold factory specifications . . . maintain proper spring tension . . . double your valve mileage.

AMAZING PERFORMANCE

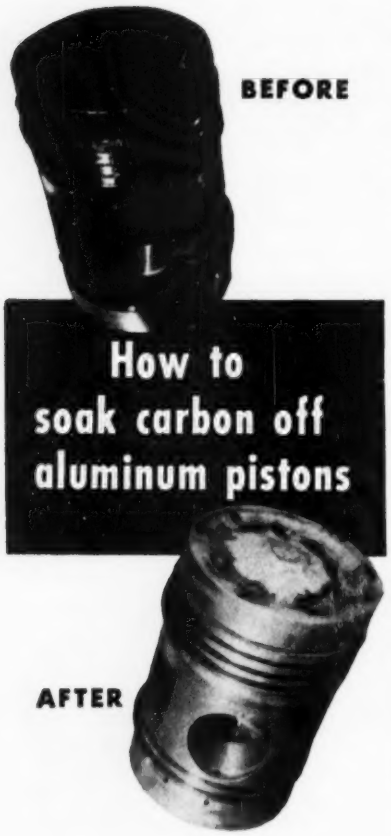
- **SAVES COSTLY BREAKDOWNS**—Eliminates 75% of valve burning, sticking and breakage. The *predetermined* expansion clearance machined in between the threads of the P-B seat also eliminates 75% of valve port cracks due to radial pressure of expanding pressed-in seats. P-B *stress-relieves* this area.
- **REPLACMENT OF SEATS MANY TIMES—WITHOUT OVERSIZE**—You can replace P-B seats without damaging the threads in counterbore or going to an oversize.
- **EASY TO REGRIND**—After long service just a light touch with the grinding stone cleans it up because it is not out of round.

CONTACT YOUR MASTER SHOP TODAY!

P-B Master Shops are now located in every major city in the U. S., ready to help you solve your toughest valve maintenance problems. Or write for further information:

Leader for 20 years in head and block valve port welding procedures

PETERSON WELDING LABS., INC.
Dept. DP-1 1423 Virginia Kansas City, Mo.



Just soak pistons for 2 to 12 hours in a solution of Oakite Composition No. 11.

This new solvent detergent, mixed 50-50 with petroleum distillate, removes and loosens the toughest carbon deposits — leaves pistons bright and clean. Safe on all metals. Has no objectionable odor. May be heated or used cold. Economical solutions have long life—need little upkeep.

Try it yourself. Ask your local Oakite Technical Service Representative. Or write Oakite Products, Inc., 22C Rector St., New York 6, N.Y.

SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS • METHODS • SERVICE
Technical Service Representatives Located in Principal Cities of United States and Canada

High Pressure Hose

Republic Rubber Division of Lee Rubber Tire Corp., Youngstown 1, Ohio, is producing a special type of flexible, high-pressure industrial rubber hose called Wiretex. Designed to carry various types of gases or fluids under all pressure, the hose is not weakened by constant vibration or flexing and will not corrode, it is claimed. It is made with a mandrel cured Reprene tube in lengths up to 60 ft and is reinforced with a textile carcass.

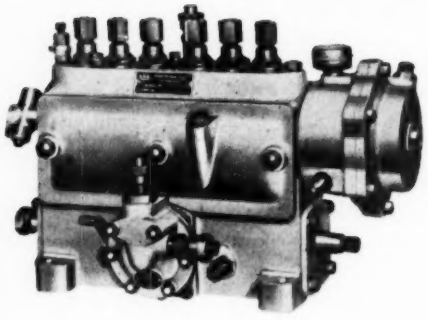
Hydraulic End-Loader

A new hydraulic end-loader for all makes of trucks is announced by the Galion Allsteel Body Co., Galion, Ohio. The unit comes in four models with loading space of 28-in by 84-in to 34-in by 90-in.

Power is supplied direct from the truck engine through a transmission-mounted power take-off, activating a hydraulic hoist which lifts or lowers the end gate. Action is controlled by a single spring-loaded lever. The unit has a load capacity of 2000 lb.

THE WORLD'S LARGEST MANUFACTURERS OF FUEL INJECTION EQUIPMENT FOR DIESEL ENGINES

Depots and Service Agents in over 100 countries



C.A.V. Fuel Injection and Electrical Equipment

C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES INC., 653, TENTH AVENUE, NEW YORK 19, N.Y.
Sales Office: 14820 DETROIT AVENUE, CLEVELAND 7, OHIO 174-480

New Literature

Preventive Maintenance Log Book

A "Preventive Maintenance Log Book" to record recommended service and maintenance operations on GM diesel oil field engine units has been prepared by the Detroit Diesel Engine Div. of General Motors Corp., 13400 W. Outer Dr., Detroit 28, Mich.

According to the company, properly timed maintenance procedures carried out as indicated in the book, will assist drilling contractors and drillers materially in reducing costs and getting maximum performance and longer life out of their power equipment.

The book outlines the various things to be done on each shift as well as those required at the end of 170, 500, and 1000 hr of engine operation. Space is furnished for recording of completed items and for keeping a running record of hours operated, repairs made, and amounts of lube and fuel oil used. Complete information on all phases of diesel engine operation, including the company's torque converter, is also provided.

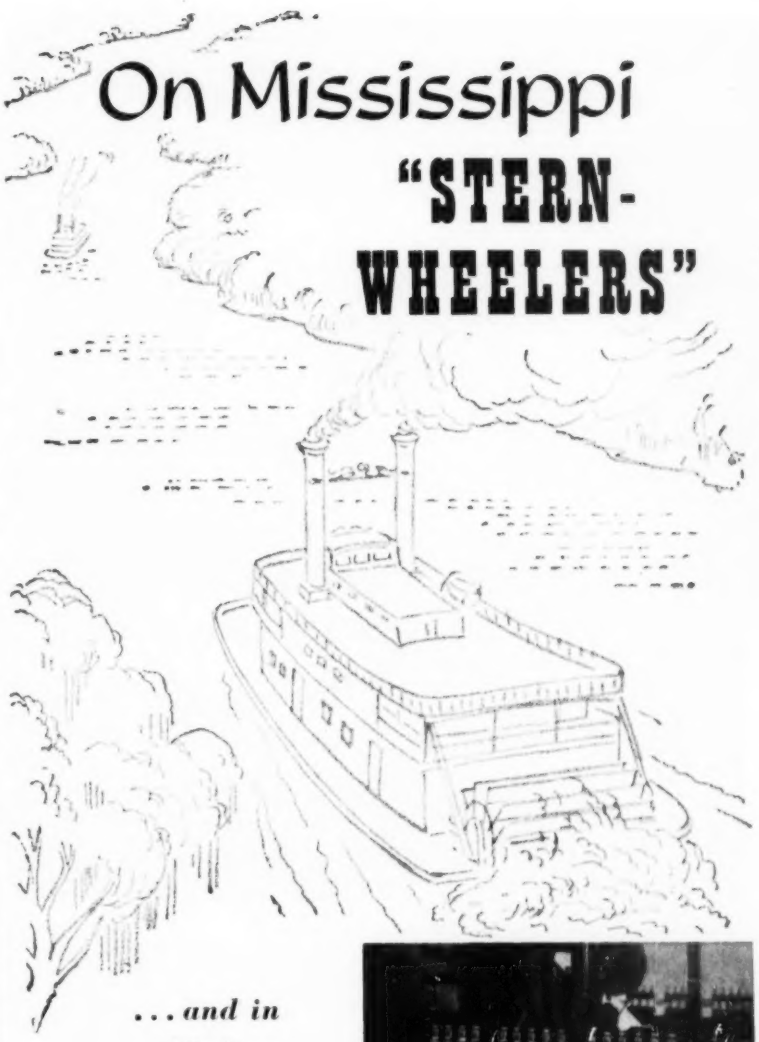
New Compressor Catalog

A comprehensive 44-page catalog, released by the Cooper-Bessemer Corp., Mt. Vernon, Ohio, provides basic application data with design specifications on the company's complete line of reciprocating compressors from 100 to 5000 hp. Described are the type EM, FM and JM multi-stage and multi-cylinder units designed for use on a broad range of industrial air compressing and chemical processing operations.

Electronic Analog Computer

Computer Corp. of America, 103 Lafayette St., New York 13, N. Y., has released a 12-page catalog complete with full product description and specifications of their Integro-Differential Analyzer.

The catalog discusses the general theory of analog computers and describes the method of setting up problems for solution with graphical illustration of typical examples in various fields of dynamics.



. . . and in Modern Industrial Plants

The picturesque packets that ply the Mississippi . . . like steam or Diesel powered boats on rivers, lakes and seas throughout the world . . . depend on Manzel Force Feed Lubrication for protection of vital wearing parts. Manzel Lubricators automatically supply just enough oil to each point, insuring years of trouble-free service from engines, presses, and other heavy machinery. Insist on Manzel Lubrication in your new equipment — or install it on your old. For further information write Manzel, 271 Babcock Street, Buffalo 10, N. Y.

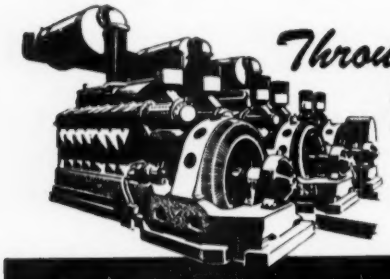
Manzel FORCE FEED LUBRICATION

A DIVISION OF FRONTIER INDUSTRIES, INC.

ASK THE AEROFIN MAN
About Practical Heat Exchange

There is a competent Aerofin heat-transfer engineer near you—qualified by intensive training and long experience to find the *right* answer to your own particular heat-exchange problem—and backed by the research and production facilities of the pioneers in light-weight extended surface.

Ask the Aerofin Man.



Throughout the Power Industry—

Aerofin units do the job Better, Faster, Cheaper

AEROFIN CORPORATION
410 South Geddes St.
Syracuse 1, N. Y.

Aerofin is sold only by manufacturers of nationally advertised fan system apparatus. List on request.

Oil-Free Air Compressors

Bulletin A-92, just released by Joy Mfg. Co., Oliver Bldg., Pittsburgh 22, Pa., discusses the company's complete line of non-lubricated compressors from 172 to 8300 cfm, 25 to 600 hp. The compressors are designed for application where lubricating oil must not contaminate compressed air, such as in instrument control, food processing, etc.

Of the vertical, v-vertical, and semi-radial type, the compressors are heavy-duty, water-cooled, double-acting machines designed for continuous 24 hr service. Lubrication within the cylinder is made unnecessary by the use of carbon-graphite piston rings. Compression rings are spring loaded for effective seal and to compensate for wear.

Diesel-Electric Generators

"Generating Power and Profits" is the title of a new booklet issued by the Caterpillar Tractor Co., Peoria 8, Ill. According to examples listed in it, diesel-electric generator sets can be tailored to meet almost any power need.

A combination is available for any requirement, whether AC or DC, it is stated. Another choice is between the conventional externally-regulated unit and the company's self-regulated generator. A chart of electric sets shows the size ranges from 20 to 315 kw, rated for 12-hr operation.

Various applications are pictured and described in actual operating installation. Fuel consumption is given and testing is shown in progress. For large power users, it is shown that close-coupled units may be combined into multiple installations.

Metallized Rust Prevention

Life expectancies, upwards of 25 to 30 years, on iron and steel structures and equipment is claimed to be provided by protective coatings of metallized zinc or aluminum in a new bulletin released by the Metallizing Engineering Co., Inc., 38-14 30th St., Long Island City 1, N. Y. Application of 18 basic engineering specifications are described and illustrated in the bulletin.

"AMOT" THERMOSTAT

"Performance without trouble" is the reason more engine manufacturers, pipe lines, power plants, oil companies and shipyards are using AMOT as standard for automatic engine water and oil temperature control. AMOT thermostats offer the following advantages:

1. Large capacity combined with light weight.
2. Excellent reliability even under extreme shocks and vibration.
3. No external bulbs or tubing to break and cause trouble.
4. Temperature is fixed and cannot be tampered with by operator.
5. Holds close regulation and is not sensitive to pressure.
6. Operating forces are very large and with no packing glands there is no chance of valve ever sticking or becoming inoperative.
7. Because of its simple and rugged construction, practically no maintenance is ever required.
8. Has positive 3-way valve action in which full pump capacity flows through the engine at all times.
9. Compact in size and will operate in any position, which facilitates piping.
10. Available in pipe sizes up to 6" for all types of gas and diesel engines.

Write for catalog and name of your nearest AMOT representative.

AMERICAN MOTORS CO., RICHMOND 5, CALIF.

For FUEL TRANSFER and HYDRAULIC GOVERNOR SERVICE

You Can Depend on **TUTHILL** *Model L Pumps*

Here is the pump that's known throughout the diesel industry for its dependable performance in fuel transfer and hydraulic governor service. Tuthill Model L is a positive displacement, internal gear rotary pump, mechanically sealed for quiet, leak-free operation and low power consumption. Capacities from .33 to 3 g.p.m. in wide pressure ranges. Available as either single or double-pump units. Write for Tuthill Model L Bulletin.

25th Anniversary

TUTHILL PUMP COMPANY

939 E. 95th Street, Chicago 19, Illinois

HILCO LUBE and FUEL OIL PURIFICATION

Get Rid of Dirty Oil . . .
Get Lower Operating Costs,
Longer Equipment Life

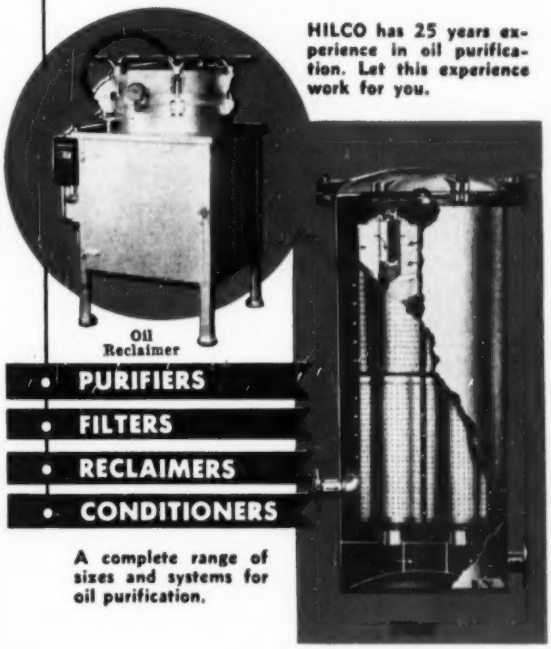
HILCO oil purification means complete oil purification! With a HILCO you get removal of sludge, acids, carbon, water and fuel dilution economically and efficiently. HILCO operation is continuous, all-electric and automatic.

Clean oil at all time reduces down time, increases production and HILCO units pay for themselves in savings.

HILCO offers a wide range of oil purification units . . . one to meet your needs. Write us about your equipment . . . and get recommendations at no obligation.

• *THERE'S A* **HILCO** *FOR EVERY LUBRICATION AND FUEL OIL FILTERING PROBLEM*

HILCO has 25 years experience in oil purification. Let this experience work for you.



Oil Reclaimer

- PURIFIERS
- FILTERS
- RECLAIMERS
- CONDITIONERS

A complete range of sizes and systems for oil purification.

• *WRITE FOR* **FREE** *LITERATURE ...NO OBLIGATION ON YOUR PART*

THE HILLIARD Corporation
120 WEST FOURTH STREET
ELMIRA, N. Y.

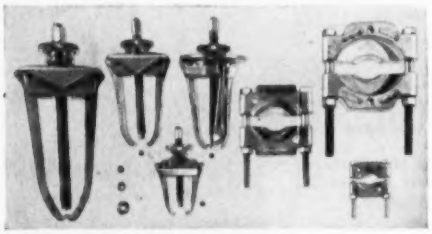
In Canada:
Upton-Bradeen-James, Ltd. • 390 Bay St., Toronto
3464 Park Ave., Montreal

handle ALL pulling jobs
swiftly . . . easily . . . with
Snap-on*
INTERCHANGEABLE
PULLER TOOLS

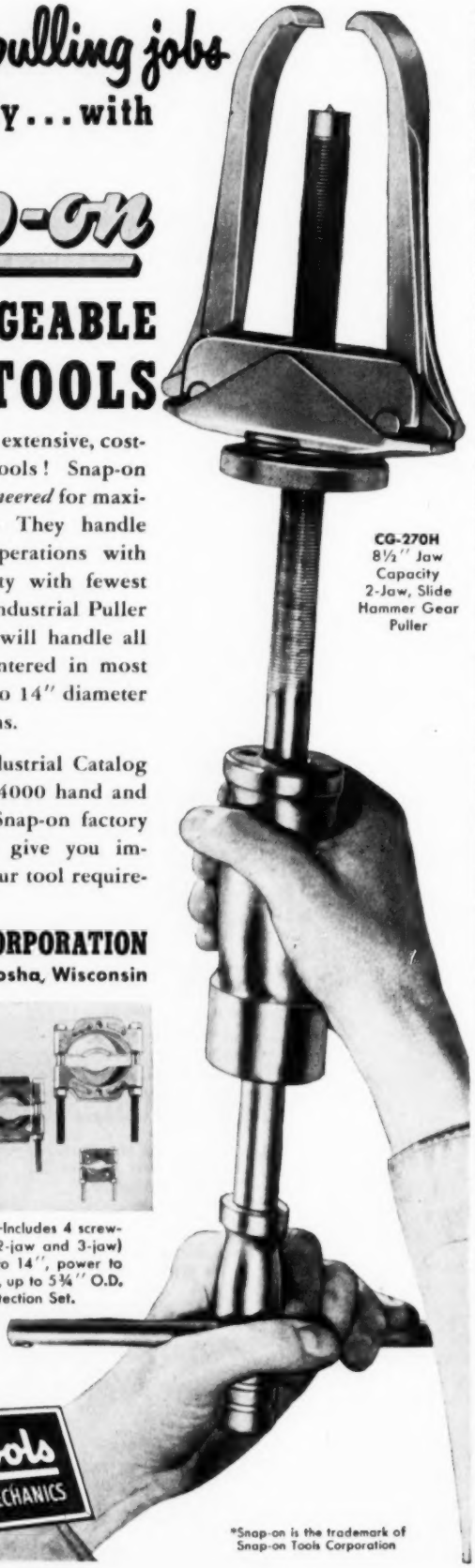
NO NEED to invest in an extensive, costly assortment of puller tools! Snap-on pullers and parts are *engineered* for maximum interchangeability. They handle the widest range of operations with greatest speed and safety with fewest units, lowest cost. The Industrial Puller Set illustrated, CG-608, will handle all puller operations encountered in most shops—size capacity up to 14" diameter with power up to 20 tons.

Write for Snap-on Industrial Catalog and General Catalog of 4000 hand and bench tools. A nearby Snap-on factory warehouse is ready to give you immediate service on all your tool requirements.

SNAP-ON TOOLS CORPORATION
8064-A 28th Ave. • Kenosha, Wisconsin



CG-608 Industrial Puller Set—Includes 4 screw-type pullers—small, medium (2-jaw and 3-jaw) and large. Size capacity up to 14", power to 20 tons. 3 Bearing Separators, up to 5¾" O.D. capacity, and Screw Point Protection Set.



CG-270H 8½" Jaw Capacity 2-Jaw, Slide Hammer Gear Puller

Snap-on Tools
THE CHOICE OF BETTER MECHANICS

*Snap-on is the trademark of Snap-on Tools Corporation

Pressure Regulators

Catalog 29, issued by Fischer & Porter Co., Hatboro, Pa., describes their new constant pressure differential regulator and new instrument air pressure regulator. The first is a compact unit consisting of the air pressure regulator and a new phenolic body Purgerator meter, piped together on a bracket for wall mounting, or with a bezel to permit front or rear panel mounting. The unit is used to regulate purge flows, liquid level measurement, or in dual arrangement for specific gravity measurement.

The new instrument air pressure regulator was developed for internal case mounting with P-4 Pneumatrol pneumatic controller series. It is a compact unit with a pressure balanced valve to maintain constant discharge pressure with very low "droop".

Steel Price Calculator

The Chicago Steel Service Co., P. O. Box 6308, Chicago 80, Ill., is offering a new stock list with a price calculator adjunct which quickly converts pricing code numbers on all stainless steel items listed into current prices in all quantity brackets.

Electrode Rapping System

A new 6-page bulletin with illustrated information on the recently developed magnetic impulse continuous electrode rapping system for electrostatic precipitators, has been announced by Research Corp., Bound Brook, N. J. Operation of the self-monitoring electrode cleaning system is explained with circuit diagrams and photos of major components, including a summary of the rapper features.

V-Belt Bulletin

The "Texrope" grommet v-belt, for which 20 to 50 per cent longer life is claimed, is described in a new bulletin released by Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. Made without a splice, the belt is claimed to be cooler running, shock absorbent, to offer less slip and more grip, to have less shrinkage and stretch, and to be 20 per cent stronger.

Vertical Pump Bulletin

The Johnston Pump Co., 3272 E. Foothill Blvd., Pasadena 8, Cal., has issued a new bulletin describing its line of vertical turbine pumps for handling diesel fuels, ammonia, and other volatile liquids. Design advantages are detailed and mechanical features are illustrated with cross section drawings.

Vibration Analysis

The International Research and Development Corp., Columbus, Ohio, has published a 4-page booklet describing their model 652 "Vibraton" vibration analysis instrument.

The Vibraton is a portable instrument slightly larger than a typewriter which has two direct reading meters giving readings of frequency (rpm) and amplitude of vibration (displacement). Standard 110 volt power is all that is needed to operate the analyzer.

Heavy-Duty Oil Filters

A new 52-page catalog, featuring heavy-duty service oil filters and cartridges, has been released by the De-Luxe Products Corp., LaPorte, Indiana. The catalog contains valuable oil-and-engine facts for everyone concerned with heavy-duty automotive service.

How to Solve Pumping Problems

The Geo. D. Roper Corp. of Rockford, Ill., has issued a 36-page manual entitled, "How to Solve Pumping Problems." Starting with a general explanation of rotary gear pumps and factors of pumping problems, the manual lists sample problems and then devotes the major portion of the manual to technical data.

New TS Diesel Bulletin

Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y., has published a new bulletin on its TS diesel engine, a 7-in bore by 8½-in stroke, 900-to-1000-rpm diesel, in the 200-to-400-hp class.

The 12-page, 3-color catalog incorporates sectional wash drawings, installation views and diagrams. Specifications, weights, performance curves, and dimension tables are included.

Magnetic Separator

S. G. Frantz Co., Inc., Engineers, Trenton 6, N. J., have made available Bulletin 101 providing complete information on their "Ferrofilter" permanent magnet separator.

The equipment is designed for the effective removal of abrasive ferrous particles and chips from circulating lubricating systems on machine tools, internal combustion engines, etc. The bulletin is illustrated and includes cross-sections showing how the units operate, and provides details on recommended applications, available sizes, capacities, and dimensional data to facilitate installation.

Progress of Lubricants

The Texas Co., 135 E. 42 St., New York 17, N. Y., in its December issue of *Lubrication*, describes the progress in development of lubricants from 1902 to 1952. Subjects discussed include, crude selection, greases, addition agents, synthetic oils, and field testing.

Wrought Iron Identification

Five tests for the positive identification of wrought iron pipe are described in a brochure just published by A. M. Byers Co., Clark Bldg., Pittsburgh, Pa.

HERE IS ONE MAN WHO CAN HELP KEEP CRANKSHAFT RECONDITIONING COSTS DOWN

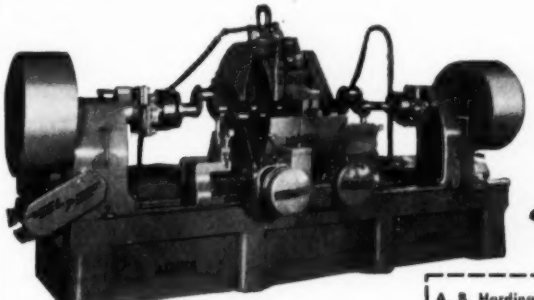
The initial cost of a diesel crankshaft grinder is the one single item that contributes more to grinding cost than any other factor.

By being the first to redesign cumbersome costly grinders Lempco expanded the opportunities and lowered the cost of shaft grinding.

Shafts from Alco, Cummins, Fairbanks-Morse, EMD, Cooper-Bessemer, Superior, Waukesha, can be reground to manufacturers' tolerance.

Among the features are an outboard balancing system that balances any shaft in a matter of seconds; rapid hydraulic infeed and retraction; variable hydraulic traverse feed for power grinding.

There is one way to keep abreast of growing diesel rebuilding service. Have one of our field service men go over your requirements and make a recommendation of the type of machine best suited for your shop. The information is yours for the asking. Mail coupon. Lempco Products Inc., Bedford, Ohio.



LEMPCO

For 35 years—a leading builder of machine tools

A. B. Harding, V. P. Sales, D.P.
Lempco Products, Inc., Bedford, Ohio

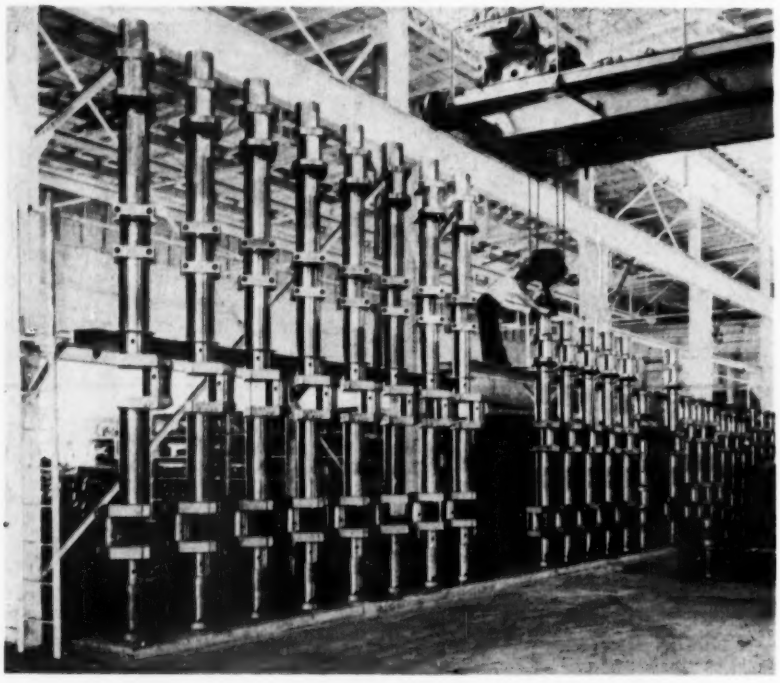
Gentlemen:
Please send information on RCG Crankshaft Grinders.

Name .....

Address .....

City ..... State .....

Field Notes



Crankshaft Storage Space Cut 80 Per Cent

Where storage area is at a premium, careful planning can simplify or eliminate warehousing dilemmas. Such was the case at the Cooper-Bessemer Corp., Mt. Vernon, Ohio. Normally 1500 sq ft of warehouse space would have been needed to store finished crankshafts. This has been cut to 300 sq ft by simply storing the shafts in a vertical position.

Crankshafts are secured by bolting to a flange plate in the floor and tieing to a platform with simple clamps as a safety precaution. To facilitate lifting and handling, a lifting clamp is used on the crane block. This method of storing eliminates any possibility of distorting these precision machined shafts.

Formerly it was necessary to coat the shafts with heavy grease and store them outdoors. However, with the new storage system, the units can be stored inside without taking up a major portion of the warehouse's limited facilities.

New Diesel Refrigerator Car Tested by Canadian Railways

A mechanical refrigerator car, the first of its type in Canada, capable of keeping its loading at a constant 10 deg below zero Fahrenheit, or if needed, of heating it up to 60 deg above zero, is making a series of test runs.

The car is a standard Canadian Pacific Railway overhead refrigerator car, previously capable of lowering the temperature under maximum refrigeration to 10 degrees above zero, remodelled as part of a program of refrigeration development jointly being carried on by railways in Canada.

The overhead ice tanks and floor level heating unit were removed, and in their place, the mechanical refrigeration unit was installed in one end of the car, taking up a 6½-ft area from the end bulkhead. This left the car with an overall capacity of 1895 cu ft.

Where the tanks used to be in the roof of the car, there is now an air distribution duct leading from evaporator coils and electric strip heaters situated over the motors. The refrigeration unit is a Trane 6-cyl compressor, using Freon as the refrigerant. A separate diesel motor drives an alternator which supplies power for the refrigerating and heating equipment.

The car carries 340 gal of diesel fuel for 12 days of constant operation. The heating units are also used to defrost the refrigerating coils, this being done automatically. Equipment for the installation was supplied by the Trane Co. of Canada. It is expected that the car will run between Montreal and Toronto until this month, when a joint test will be run to the west coast from Toronto.

GM to Display 1953 Line

General Motors Corp. will unveil the first complete display of its 1953 automotive lines at New York's Waldorf-Astoria Hotel from Jan. 17-Jan. 23. The show, "GM Motorama of 1953", will be the first Waldorf presentation since 1950, and will cover virtually every phase of today's transportation. The railway, marine and heavy-duty phases of transportation and motive power will be illustrated in a diesel group, including Electro-Motive, Detroit Diesel and Cleveland Diesel divisions.

Waste of Engineering Talents Seen in Research Survey

Though engineers are in short supply, many are now used in jobs that non-engineers could do as well. This is the finding of a recent report issued by the National Society of Professional Engineers.

In a year-long survey, the group studied almost 500 companies employing some 106,000 engineers and found that industry could make better use of its engineers by analyzing staff assignments and standardizing and simplifying many routine engineering jobs so that they could be done by supporting personnel. This would free

engineers to concentrate on creative work.

The report, entitled "How to Improve the Utilization of Engineering Manpower", found that the ratio of engineers to total employees in defense and defense-supporting industries has changed from an average of one in forty in 1940 to one in twenty at present. High demand for engineers currently was discovered not to be tied to defense alone, but to modern industrial, business, and scientific requirements.

In 42 per cent of the companies surveyed, engineering turnover was a problem. In general, incentives were considered more important than benefits. Shown in importance, the incentives are: advancement opportunities, stability of employment, extra training opportunities, essential industry, and profit-sharing plan.

Authority on Supercharging Visits Cooper-Bessemer

Dr. Alfred Buchi, head of Buchi Syndicate in Switzerland, discusses phases of supercharging with old acquaintances, Ralph Boyer (right) and John Fulleman (left) at the Cooper-Bessemer Corp. plant in Mt. Vernon, Ohio. Mr. Boyer is vice president and

chief engineer at the company. Mr. Fulleman, presently designer of turbochargers for the company, was for many years assistant to Dr. Buchi.

Dr. Buchi first applied the principle of the turbocharger to European diesels in 1925. In 1934, he and Ralph Boyer worked on one of the first applications of turbocharging on a Cooper-Bessemer engine.

1952 Set Petroleum Peak

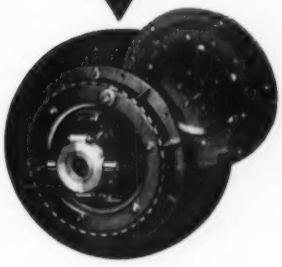
Production, processing and distribution of petroleum soared to new all-time highs last year as the American people consumed more oil products in more ways than ever before in history. This was revealed in a year-end report by Frank M. Porter, president of the American Petroleum Institute.

Domestic demand approximated 2 billion 650 million bbl and total demand (which includes exports) exceeded 2 billion 800 million bbl. However, Porter described the 1952 increase as modest in comparison to the larger gains of recent years, an indication that the post-war surge in demand is levelling off to more normal growth.

More crude oil, natural gas liquids, natural gas and distillate fuel oil were produced than in any other 12-month period. Refinery capacity and amount of crude oil processed reached all-time peaks; a record-breaking number of wells were also drilled. It was indicated that oil industry's total for capital expenditures since the end of World War II is approaching $20 billion.

The API president estimated the production of liquid petroleum in 1952 at 2 billion 516 million bbl, an increase of 66 million bbl over 1951,

15% More Air Pressure



30% to 40% More Work

JAEGER "Air Plus" COMPRESSORS are setting new standards of breaking, trenching, ditching, digging, tamping and pressure-testing in pipeline construction. ROCKFORD CLUTCHES help this light, portable compressor do over a hundred labor-saving jobs. Let ROCKFORD clutch engineers help your product engineers utilize the most efficient power transmission controls for your machines.

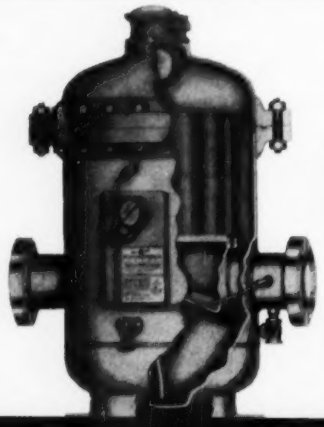
ROCKFORD CLUTCH DIVISION BORG-WARNER
1301 Eighteenth Avenue, Rockford, Illinois, U. S. A.

B-W ENGINEERING MAKES IT WORK

B-W PRODUCTION MAKES IT AVAILABLE

ENGINEERING BULLETIN SENT ON REQUEST

ROCKFORD CLUTCHES

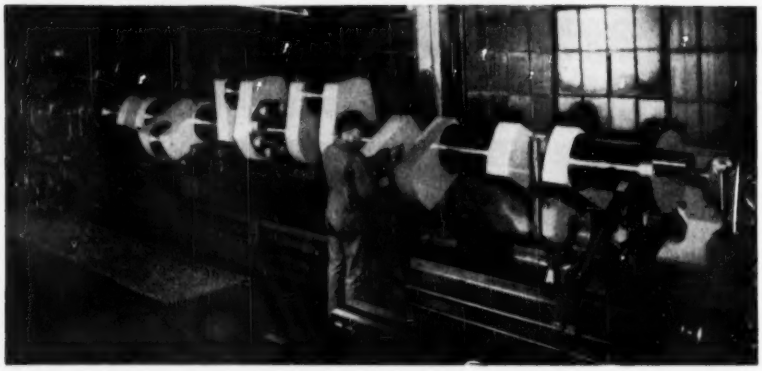


EXCEL-SO
5 MICRON
FILTERS
for
DIESEL
FUEL

Designed to remove dirt (down to 5 microns) from diesel fuel . . . removal of this microscopic rouge lengthens the life of diesel engines, pumps, meters, valves, and fittings. They ar compact in size and are built for operating pressures from 0-2500 psi. EXCEL-SO Filters can be built to any code requirement, API-ASME, ASME or state codes for unfired pressure vessels. They also meet requirements of JAN or MIL specifications. Available in capacities from 10-2000 G.P.M. Many now in use by leading railroads. Special "Throwaway" Plastic Filter Bundle available on request. Write for Bulletin FO-52.

WARNER LEWIS COMPANY
BOX 3096 • TULSA, OKLAHOMA

DIESEL CRANKSHAFT
REPAIRING AND REFINISHING



Picture shows a thirty-foot crankshaft with 13" diameter journals which was broken through the No. 6 web— receiving final inspection after new crank and center coupling sections were installed and machined to original tolerances.
Shafts of all sizes and types successfully repaired and refinished.
Call, wire or write for particulars on our field repairs and emergency service.

WASHINGTON IRON WORKS, INC.
Established 1876
SHERMAN, TEXAS

which includes production of 2 billion 295 million bbl of crude oil and 221 million 175 thousand bbl of natural gas liquids. Natural gas was estimated at 10 trillion 500 billion cu ft, an increase of more than 800 billion cu ft over 1951.

A thumbnail picture of U.S. supply and demand follows:

(Daily averages in thousands of bbl)

	1952	1951	1948	1941
SUPPLY				
Crude production	6271	6149	5520	3842
Natural gasoline	604	564	402	231
Imports, all oils	948	843	514	266
Total	7823	7556	6436	4339
DEMAND				
Domestic demand	7240	7032	5775	4071
Exports, all oils	426	423	368	298
Total	7666	7455	6143	4369

New Ignition Improver For Diesel Fuels

Commercial availability of a new ignition improver for diesel fuels, following a year's test program with the U. S. Navy, is announced by Ethyl Corporation. Shipments will be made available in tank car and 55-gal drum quantities with distribution to be handled from both coasts.

Called Ignition Improver (DB-36), the new additive is designed to help refiners produce desired grades of diesel fuel simply and economically, and is possible with all types of diesel fuel, it is announced. The compound, consisting of a mixture of primary amyl nitrates, is blended into the fuel in minute quantities, increasing the tendency of the fuel to ignite. The blending operation can be performed either at a refinery or a storage terminal. No unusual safety precautions are required.

With successful completion of the Navy tests, the company is prepared to recommend it for use in Navy specification diesel fuels and points out that this is the first time that any additive has been permitted in specification diesel fuel supplied for the Navy's surface and underwater craft.

Tin Scarcity a Myth Malayan Bureau Claims

As part of an educational program designed to promote a better understanding between Malaya, world's largest tin producer, and the United States, world's largest tin consumer, the Malayan Tin Bureau, Washington, D. C., has published a factual booklet

for free nationwide distribution. The booklet denies that tin is scarce and that Malayan tin producers have formed a cartel to control production and prices.

The importance of tin in industry is emphasized as a key component of bearing metals and a prime ingredient of solder. The booklet points out that distribution of tin in the United States is controlled by the government and claims that consumers have been kept short of tin although there is plenty of tin outside the United States.

In statistical tables, world production of tin in 1951 was revealed to be 164,440 long tons and world consumption 139,773. It is stressed to be to the interest of the United States that a strategic stockpile of tin be built up since it produces hardly any tin ore and that most of the world's tin is in Southeast Asia.

"Piano Roll" Age Foreseen

American industry is on the threshold of the automatic age, the Council for Technological Advancement observes in a report on "Automatic Control and the Automatic Factory". Applications of automatic control to processing variables such as pressure, temperature, flow and level has already been transformed from laboratory experimentation into practical mass production, and are steps in this direction.

According to the report, tomorrow's machine will be "guided . . . without human intervention, in response to a series of instructions previously recorded in numerical code on such media as cards, paper tape, magnetic tape, or film." It is envisioned that machines of the future will be operated on much the same principle as the player piano responding to a perforated piano roll.

The Council points out that there has always been a need for flexible machines in short run production industries, capable of manufacturing small quantities of several different parts, as opposed to special purpose machines used in mass production designed to produce a single or few parts. Numerically controlled machines, give great promise of breaking this bottleneck.

Bonded Wire Strain Gauge Has Weigh-at-Job Application

A bonded-wire strain gauge, tradenamed SR-4, is finding practical application for weighing on the job, making it possible to weigh almost everything, saving handling, time, and floor space. Reduced or negligible scale maintenance is another important factor.

Principles of the process were discussed in a paper presented by Arthur C. Ruge, consultant, Baldwin-Lima-Hamilton Corp., at the 4th Biennial Materials Handling Conference in Buffalo, N. Y.

The active element of the strain gauge, is a very fine filament of wire, about one-thousandth inch in diameter, running back and forth in a grid pattern to give adequate resistance. A typical grid may measure ¼-in long by 3/16-in wide, and have a resistance of 120 ohms. It is soldered or welded to two lead wires.

The filament is imbedded in a

REPOWERED
and REJUVENATED with
S-N
REDUCTION GEARS

THEY EASE YOU THROUGH THE TOUGH ONES

Eliminate Costly Repairs—
Replacements and Down Time

Insure "like-new" performance by repowering your industrial equipment with the world famous S-N heavy duty, herringbone Reduction Gears. Hundreds of S-N installations in construction equipment are being used to transmit the full power from engine to load smoothly, quietly . . . at the most economical speed of the driven equipment. They're built to lick the grueling, extra tough continuous assignments!

S-N Reduction Gears are available in a broad range of reduction ratios — of 1.5:1 up to 4.1 and from 50 to 900 H.P. Why not take advantage of the nearly half century of S-N transmission experience? Let S-N engineers specify the best unit for maximum performance on your equipment.

SNOW-NABSTEDT
Transmission Engineers
FOR NEARLY HALF A CENTURY
INDUSTRIAL DIVISION
THE SNOW-NABSTEDT GEAR CORP., HAMDEN, CONN.

cement matrix and insulated from the material by bakelite. Since this "gauge" is bonded to the material to which a strain is applied, the filament changes its electrical resistance in proportion to that strain. The change of resistance is measured as it appears across the gauge terminals.

First General Service Diesels For Newfoundland

The first batch of diesel locomotives to see general service in Newfoundland are due to arrive in that area this month, it was revealed. Three are scheduled for this month with six more slated to arrive in February and March.

Diesel locomotives made their appearance in Newfoundland several years ago, but their operations have been confined to yard shunting. No immediate change in the present facilities is planned, however, with diesels being an addition to, rather than a replacement for, the present fleet of steam engines.

Capital expenditure by the Canadian National Railway in the Newfoundland district will amount to approximately $2 million this year. Diesel fueling facilities are among the projects. Two new coastal vessels, to be built in Scotland, will have diesel as their motive power, the first of their kind to be put into railway coastal operation in Newfoundland.

Engineers Note Shift to Gas

Delegates to the annual meeting of the American Society of Mechanical Engineers were told that industrial use of natural gas has risen 175 per cent since 1938, as compared with a gain of 70 per cent for all mineral sources of energy. The versatility of natural gas as an industrial fuel and its controllability as a precision tool were credited by Frederic O. Hess, past president of Gas Appliance Manufacturers Association, with being responsible for the creation of many new products and processes.

"The shift to gas, mostly at the expense of coal, confirms the general trend toward replacing manpower with mechanical power," Hess said. "Specifically, it means that petroleum or natural gas, both of which are self-mining after the shaft or well is drilled, are being substituted for coal which ties up considerable manpower."

He pointed out that between 1938 and 1950, the gross value of America's industrial products rose from $90 billion to $282 billion, or 201 per cent. "Since the use of our refined fuels has risen more sharply than our national production, we can conclude that these fuels have played a proportionately large part in the growth of our productive plant."

Dieselization Brings First Profit to Australian Line

Through dieselization, the Commonwealth transcontinental rail line in Australia was enabled to show a profit for the first time in a non-war year since its construction in 1917, it was learned. The line is 1108-mi long and is one of the world's most difficult to operate profitably. It was fully dieselized with Clyde-GM locomotives in April, 1952. Profit figures are for the first quarter of 1952, during which dieselization was not yet complete.

Briggs OIL CLARIFIERS ON STATIONARY-TRANSPORT-MARINE DIESELS PAY OFF BIG...

...because they keep lube and fuel oils clean--physically and chemically!

11 YEARS AGO, the Rural Cooperative Power Association of Minnesota started using Briggs clarifiers. Now ten, including 3600 H.P. diesel engines in their five operating plants, are Briggs-equipped.

Satisfaction like this proves Briggs' performance is superior. Operating men specify Briggs wherever diesel engines are used. These men know that over the years Briggs keeps lube and fuel oils clean—physically and chemically—keeps engines running better, longer.

Let us run a check on your present filtered oil—send a sample and full engine data. We will put it through our laboratory and give you the report. If new filters are needed, we will recommend type and size.

Briggs Has The Right Filter!

★ A Briggs catalog belongs in your file—write for one TODAY!

Briggs PIONEERS IN MODERN OIL FILTRATION

THE BRIGGS FILTRATION COMPANY
RIVER ROAD, WASHINGTON 16, D. C.

FOR MORE THAN A QUARTER CENTURY

Kittell Silencers and Spark Arrestors . . .

IMMEDIATE DELIVERY!

Efficient, low-cost, heavy-duty units that stop damaging back surge . . . reduce engine noise to a whisper!

A COMPLETE LINE . . .

SILENCERS
(steel, stainless steel, ceramic coated)
Exhaust
Air discharge
Steam discharge
Water-type
Jet
Heat-recovery

SPARK ARRESTORS
(steel, stainless steel, ceramic coated)
Dry centrifugal
Water-type

FOR EVERY USE . . .

- Gas and diesel engines
- Steam generators
- Drilling rigs
- Pumping units
- Generator sets
- Compressors & blowers
- Boats and ships
- Heavy construction equipment
- Trucks and buses
- Logging and mining machinery

Specific purpose units can be manufactured to your specifications. Send for complete catalog today.

Kittell Muffler & Engineering, Inc.

915 SOUTH SANTA FE AVENUE, LOS ANGELES 21, CALIFORNIA

Free For Every GM DIESEL USER

New 48 Page Guide

Packed with Time-Saving, Money-Saving Kent-Moore Special Service Tools

Now available. Kent-Moore's comprehensive new GM Diesel Service Tool Guide. Describes and illustrates more than 300 special tools, developed expressly to meet the essential maintenance requirements of your GM Diesel engine applications. Tools that will save you money, time, and labor. Send for your copy of this Guide today! It's FREE!

KENT-MOORE ORGANIZATION, INC.
Engineers and Manufacturers of Special Service Tools and Equipment
5-105 GENERAL MOTORS BLDG. • DETROIT 2, MICHIGAN

Organizational News

Ethyl Elects Vice President

Malcolm P. Murdock has been elected a vice president and director of Ethyl Corp. He assumes responsibility for the company's sales activities as successor to Sanford M. Wagner, who will retire in February.

Mr. Murdock, who has been general sales manager for the past year, joined the company 20 years ago as a field representative. He was named motor clinic manager in 1938 and has served as assistant manager of the Los Angeles and Chicago divisions, sales manager of Ethyl Specialties Corp., and central region manager.

Alcoa Retirement

Luther R. Branting, works manager of Alcoa Mining Company's bauxite operations in Arkansas has retired after more than 32 years of active service with the company. He is succeeded by J. Thad Watters who has been assistant works manager since last March.

GM Appoints Factory Managers As Rebuild Business Grows

Appointment of L. M. Williams, J. S. Chisholm, T. O. Robertson and A. R. Walker as factory branch managers reporting to the general manager was announced by General Motors. Mr. N. C. Dezendorf, vice president of the company and general manager of its Electro-Motive Division, stated that these appointments were necessitated by increased parts and rebuild business and expansion of facilities of the factory branches.

J. S. Chisholm

T. O. Robertson

A. R. Walker

L. M. Williams

L. M. Williams started with the division in 1938 as an engine tester, moving successively to locomotive test, service engineer, parts and stores representative, sales representative, assistant rebuild manager, and most recently rebuild sales manager. He is now branch manager Halethorpe, Md.

Mr. Chisholm joined the division in 1937 as a stock clerk. Since then he has worked as stockkeeper, zone parts manager, branch service representative, branch plant superintendent and branch sales manager.

T. O. Robertson joined Electro-Motive in 1926. His activities include service instructor, service engineer, district engineer, regional service manager at San Francisco and sales manager of the Emeryville factory branch.

Mr. Walker entered the division as a field engineer in 1946, formerly having been with American Car and Foundry. He worked as district sales

representative and regional service manager in the Chicago region and then became branch sales manager for the Jacksonville, Fla., factory branch.

Other GM Changes

Other personnel changes in the Electro-Motive Div. were appointment of George W. Elsey to the newly created post of manufacturing assistant to the general manager; J. E. Hacker to assistant works manager to works manager; and E. A. Wondracheck to repair plant manager to manufacturing manager, Plant No. 1.

Mr. Elsey joined GM with the Remy Electric Co. (later to become Delco-Remy Div.) in 1923 as a process engineer. He transferred to Electro-Motive in 1936 where he served as master mechanic, plant engineer and works manager prior to his present appointment.

Mr. Hacker joined the division in 1948 as assistant works manager, transferring from Cleveland Diesel Engine Div. Previous to that he had been with the Winton Motor Car Co. and Winton Engine Works, joining

J. E. Hacker

G. W. Elsey

E. A. Wondracheck

White Motor Co. in 1920, and leaving there in 1933 to enter Cleveland Diesel as works manager.

Mr. Wondracheck started with the division as a machinist in 1935, soon after becoming a service instructor. He worked as service mechanic, special service engineer, general foreman and superintendent of all divisions of manufacturing, prior to his present post.

Borg-Warner Names President

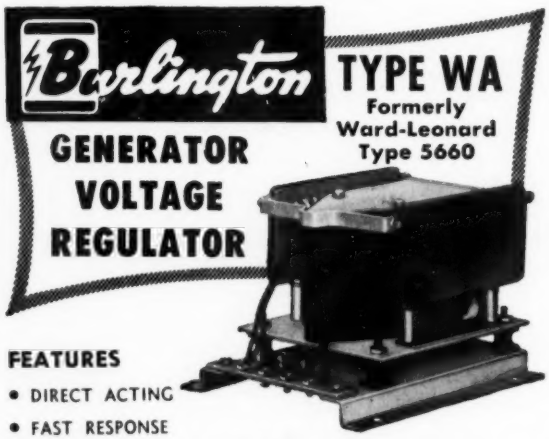
Arch A. Warner has been appointed president and general manager of the Mechanics Universal Joint Div. of Borg-Warner Corp. He succeeds G. C. Gridley who requested retirement but will be retained in a consultative capacity.

Mr. Warner has been president and general manager of the Rockford Clutch Div. of the company since 1944. He served his apprenticeship in the industry with Buick which he joined in 1905. In 1924 he was sales manager and chief engineer of Universal Products Co. He first joined Borg-Warner in 1938 as a sales engineer in the Detroit office of the Mechanics Universal Joint Div., subsequently going to Rockford as assistant works manager of that division.

Columbia Elects Manager

Columbia Electric Mfg. Co. of Cleveland, Ohio announces the appointment of Homer W. Sussman to the post of general sales manager.

"FIXED-READING"
PREMAX
PRESSURE INDICATOR
for DIRECT-READING
OF COMPRESSION AND
FIRING PRESSURES
OF EVERY TYPE OF DIESEL ENGINE
ONE OF THE FEATURES
Responsible for Its Overwhelming
Preference by Leading Diesel
Manufacturers and Operators
Maintenance requirements reduced to minimum. Needs no field adjustments, no lubrication. Calibrating means built-in—making possible quick check of calibration.
For other features, write for Bulletin 294
ACCURATE PRESSURE READINGS
as high as 1700 P.S.I.
BACHARACH
INDUSTRIAL INSTRUMENT CO.
7000 BENNETT STREET • PITTSBURGH 8, PA.


Barlington
TYPE WA
Formerly
Ward-Leonard
Type 5660
GENERATOR
VOLTAGE
REGULATOR
FEATURES
• DIRECT ACTING
• FAST RESPONSE
• AUTOMATIC CONTROL
• SMALL, COMPACT SELF CONTAINED
• RUGGED CONSTRUCTION
• RHEOSTATIC ACTION
• INEXPENSIVE
Designed for use in regulating the voltage of A.C. generators for Stationary, Mobile or Marine installations. Direct rheostatic action provides a simple, effective and automatic means of regulating voltage by performing the function of an automatic field rheostat.
Rating of rheostatic element is 2 amperes maximum exciter shunt field current at rated load and power factor. Maximum sigma watts is 50 watts.
Inquiries for complete information and engineering services solicited.
BURLINGTON INSTRUMENT COMPANY
DEPT. B-13, BURLINGTON, IOWA

Star Performers For High Pressure

500 Series
Rotary Geared Pumps
with Herringbone Gears

These quality-built Brown & Sharpe pumps are particularly suited for diesel pressure lubricating systems up to 500 p.s.i. Needle bearing construction, combined with balanced herringbone gear design, assures smooth, dependable operation at high speeds. Leakage problems eliminated by use of double self-balancing mechanical seal . . . no glands to adjust. Six sizes available with capacities from 5.1 to 37.6 g.p.m. at 0 lbs pressure. Operating characteristics fully described in Pump Catalog. Write for copy. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

WE URGE BUYING THROUGH THE DISTRIBUTOR

BROWN & SHARPE BS

Left: 2200 Class Mechanical Governor
Right: 3200 Class Hydraulic Governor

GOVERNORS by PICKERING

3700 Class Hydraulic Governor

For 90 years the name Pickering has been associated with fine governors. The full line covers all requirements of diesel, dual fuel, steam and gas engine as well as turbine speed regulation.

ALL MODELS AVAILABLE IN EITHER CONSTANT SPEED OR VARIABLE SPEED TYPES.

To secure complete research and design engineering cooperation on governor problems, write

2600 Class Mechanical Governor

THE PICKERING GOVERNOR CO.
affiliated with BUBBLER INC.
ROUTE 17 — SOUTH OF ROUTE 4
PARAMUS—NEW JERSEY
Phone HUbbard 7-1400

Mr. Sussman joined the company as a student engineer in 1935 and has held various positions in the engineering and sales departments. In his new position he assumes responsibility for an expanded sales program covering the company's line of electrical products.

New Sealed Power Manager

Donald M. Hesling, director of research and engineering of Sealed Power Corp., Muskegon, Mich., has been advanced to the position of manager of manufacturing and engineering. In his new position, Mr. Hesling will have complete charge of all the company's manufacturing operations, plus engineering and research.

Mr. Hesling joined the company in 1937 as chief draftsman. In 1940, he was assigned to methods engineering and in 1943 became assistant works manager. He was appointed master mechanic in 1946 and became director of research and engineering in 1950.

C. Lee Cook Vice Pres Dies

Robert Edwin Kirn, vice president and general sales manager of the C. Lee Cook Mfg. Co., Inc., died in Louisville, Ky., recently. He was 60.

Mr. Kirn joined the company in 1919 as a sales engineer and was

later sent to New York to establish a branch sales office where he served as manager. Subsequently, he was promoted to general sales manager of the company and in 1930 became its vice president. In the course of his long association with the company, Mr. Kirn became well known in the diesel, marine and petroleum industries.

Morse Appoints Branch Managers

Morse Chain Co., a Borg-Warner industry, announces the appointment of Walter C. Bass as manager of the Ithaca, N. Y. branch sales office, and C. H. Erbacher as manager of the Detroit, Mich., branch sales office.

Mr. Bass was formerly with the general sales department in Ithaca and will administer sales in northern New York and western Vermont. Mr. Erbacher, formerly serving in the Chicago area, will administer sales in Michigan and northeastern Ohio.

H. K. Porter Names Director

H. K. Porter, Inc., has elected a new director, Charles R. Crowder, executive vice president of Van Norman Co.

Mr. Crowder has been with Van Norman for more than 20 years, first as district manager and then as sales manager in the automotive division. He is also a past president of National Standard Parts Association.

James D. Abeles

Purolator Promotion

James D. Abeles has been appointed executive vice president of Purolator Products, Inc., Rahway, N. J.

Since joining the company in 1940, Mr. Abeles has been assistant to the president, equipment sales manager, assistant works manager, assistant plant superintendent, quality manager, and cost reduction engineer. Prior to his appointment, he was general manager of the company.

Kuljian Elects Vice President

Arthur H. Kuljian, chief mechanical engineer for the Kuljian Corp. of Philadelphia, has been elected vice president in charge of engineering.

Mr. Kuljian is a graduate of the Massachusetts Institute of Technology. He holds membership in the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the Franklin Institute.

Dravo Names Engineer Chief

McAndrew McCall has been appointed chief design engineer, Construction Dept., Machinery Div., of Dravo Corp., Pittsburgh, Pa.

Mr. McCall has held various engineering positions throughout the world, his latest was that of chief engineer and general superintendent of Compania Tecnical y Constructora in Mexico and South America. He was graduated from the China National University in 1924.

Caterpillar Promotion

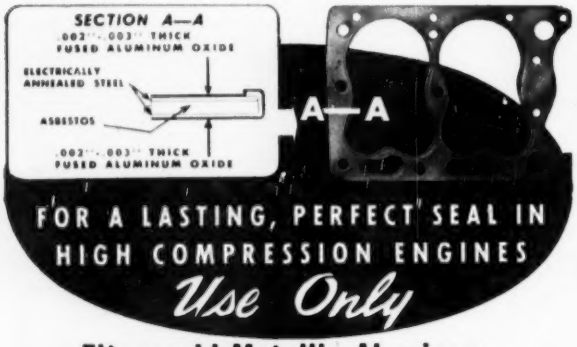
Ralph J. Furstoss has been promoted to assistant director of research by Caterpillar Tractor Co. He takes charge of tractor and earthmoving research projects.

Mr. Furstoss joined the company in 1934 and became a field engineer in 1936. Subsequently he was made supervisor of field engineering, a job he held prior to his most recent assignment.

Alco Chief Engineer Dies

Kendall B. Rowell, 52, recently appointed chief engineer of American Locomotive Co., died following illness and an operation this past month. Mr. Rowell had been responsible for product development and engineering in the locomotive division with headquarters in Schenectady, N. Y.

Mr. Rowell joined the company's engineering department in 1940 at New York and was transferred in 1945 to Schenectady as liaison engineer. He was appointed commercial engineer in 1950 and in 1952 was named executive engineer. Before joining Alco, he worked for the New York Central Railroad.



FOR A LASTING, PERFECT SEAL IN HIGH COMPRESSION ENGINES
Use Only

Fitzgerald Metallic Aluminum-Fused-Oxide Steel Asbestos Gaskets

Grease Retainers — Cork Gaskets

FITZ-Rite Treated Fiber Gaskets for oil, gasoline and water connections. Complete Sets For Motor Rebuilders.

FITZGERALD *Gaskets*
SINCE 1906

The Fitzgerald Manufacturing Company
TORRINGTON, CONNECTICUT

There's a Fitzgerald Gasket for every Engine

We are Experts in Re-Manufacturing Injectors!

SAVE WITH INTERSTATE
LOW COST
DOUBLE-TESTED

GM-71

Interstate Diesel Service Features:

1. We ship *immediately* on receipt of your order. *We do not wait for your unit.*
2. Every part carefully inspected. Only genuine replacement parts used when needed.
3. All re-manufacturing work done in modern shop using the latest precision equipment.
4. Every unit thoroughly double-tested and guaranteed to meet the most rigid specifications.
5. FOR SMALL EXTRA CHARGE WE WILL CONVERT ANY INJECTOR FROM ONE SIZE TO ANOTHER.
6. 60-70-80-90 and DF6's available from stock. Exchange size for size.

NOTE: Check our repair service on series No. 110 injectors, fuel transfer pumps and blowers.

SAVE WITH INTERSTATE—SEND TRIAL ORDER NOW!

Attractive Distributor and Dealer Propositions Left in a Few Areas—Write!

INTERSTATE DIESEL SERVICE, INCORPORATED
7120-A CARNEGIE AVE. • CLEVELAND 3, OHIO
"AMERICA'S FINEST DIESEL COMPONENT REBUILDERS"

Specify VIKING For Your Future PUMP PLANS

Check today on your pumping equipment needs. Viking offers the most complete line in the rotary pump field. The range of sizes and styles are the largest available.

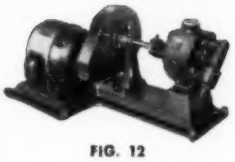


FIG. 12

Each is built to handle the specific job. Outstanding features include fast self priming . . . smooth, even discharge . . . low power requirements . . . compact and rugged construction.

VIKING AN HONORED NAME IN PUMPING

Send today for free bulletin 53SD.

See Our Catalog in SWEETS

Viking Pump Company Cedar Falls, Iowa

KIENE®

DIESEL INDICATOR TELLS YOU WHEN TO OVERHAUL

Gives Compression and Firing Pressures Faster—Saves You Time and Money!

With the KIENE DIESEL PRESSURE INDICATOR, you waste no money on costly overhauls done too soon—take no risk of putting off overhauls until too late.

The KIENE INDICATOR tells, reliably by accurate measurement of compression and firing pressures, when your engine needs attention.

SIMPLE—no complicated adjustments. **RELIABLE**—not affected by heat. **ACCURATE**—effects of friction and inertia eliminated. **RUGGED**—only one moving part. **COMPACT**—weighs less than ten pounds.

LOW IN COST—For full details, send for Bulletin K-100.

KIENE DIESEL ACCESSORIES, INC.
10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS

Waukesha Turbocharges

(*Continued from page* 43)

The water circulating pump is gear driven and incorporates a double-vane bronze impeller. Considerable attention has been given to directing coolant flow so that all critical areas are assured of ample cooling. Radiators are sectional and protected by sturdy guards. Air flow is assured by an 8-blade, 48-in fan. Cluster by-pass thermostats speed warm-up and maintain proper temperatures.

In this case, the turbocharger is mounted at the flywheel end of the engine. A water-cooled manifold connects directly to the turbine end. Air enters through triple oil bath-type filters and is piped to the turbocharger end where it is forced into the intake manifold.

This unit is supported on a flat box base. Either an SAE size 00 bell housing-inclosed or an open-type flywheel arrangement can be obtained. In any case there is a ring gear for starting purposes. Waukesha's model FC 4-cyl engine starter can be used. As before, various controls, instruments and accessories are available to suit the application.

The Turbochargers

A spectacular example of what can be achieved with turbochargers in diesel automotive application was the exceptional performance of the Cummins race car at Indianapolis last year. The same family of Elliott turbochargers has been applied to the Waukesha models 148-DKS, 6-WAKDS, 6-NKDS, and 6-LRDS. The model M-5 is used on the first three and the M-10 on the larger engine. A Schwitzer-Cummins turbocharger is used on the model 135-DKBS engine.

The advantages of utilizing waste energy in exhaust gases to supply a more dense charge of air to the cylinder has long been recognized. In the case of smaller engines this has not been possible until fairly recently due to the absence of small production turbochargers. Mechanical blowers have been used to advantage but greater specific outputs are now possible due to the reduction in parasitic loads on the engines through utilization of exhaust gas energy instead of power derived from the engine.

Mechanical blower drives have had the advantage of delivering scavenging air in proportion to engine speed. Older turbocharger designs were not so responsive to speed changes and as a result, acceleration characteristics of the engine suffered. Current design improvements involving lighter rotating parts, improved bearings and more efficient turbine and compressor design have permitted the torque curves to be pretty well tailored to suit the application. The designers indicate that still greater flexibility is in prospect.

The Elliott turbochargers approximate their larger counterparts in general construction. The impeller and turbine wheels are mounted at the ends of a shaft. The latter

(*Continued on page* 102)

(*Continued from page* 101)

turns in two well-lubricated bearings as widely spaced as possible to provide good stabilization, and support close to the impeller and turbine wheel. Water-cooling is confined to the area surrounding the bearing at the turbine end. Piping is such as to provide some thermal circulation of the cooling water when the engine is shut down. Filtered oil from the engine system lubricates the bearings.

Air flow through the compressor is conventional with axial entry and radial discharge through the scroll case. In contrast with the larger units, exhaust gases enter the turbine radially to the nozzle ring and discharge axially. The turbine and compressor are close together and heat radiation from the hot turbine scroll case to the compressor is reduced considerably by shielding.

Why Turbocharge?

The primary reason for turbocharging is to obtain higher specific output from an engine. This means a better horsepower/weight ratio, improved mechanical efficiency and, as a result of the latter, better fuel efficiency.

Waukesha has achieved all of these advantages. The specific gains in horsepower with no sacrifice in dependability have been listed earlier. These were achieved without aftercooling. All of the units have shown lively acceleration, clean burning with all standard diesel fuels having cetane values of 45 or above, an excellent reserve of power and improved overall economy.

A FREE Sample for a Friend

If you have a friend or associate who you think might be interested in reading DIESEL POWER & DIESEL TRANSPORTATION, and would like to send him a free sample copy, we should be glad to cooperate with you. All you need to do is to fill in the convenient coupon while you have it in hand and drop it in the mail today. There is absolutely no cost or obligation to you. PLEASE PRINT PLAINLY.

To: DIESEL POWER & DIESEL TRANSPORTATION
192 Lexington Avenue, New York 16, N. Y.

Without cost or obligation on my part, you may send a free sample copy of DIESEL POWER & DIESEL TRANSPORTATION to:

Name .....

Title or Position .....

Company .....

Street Address .....

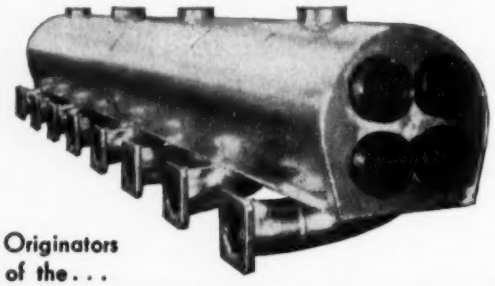
City ..... Zone ..... State .....

My name is .....

Address .....

Save...
with Precision Manifolds built by FLORI

fabricated from "pre-machined" parts
. . . ready for attachment to the engine

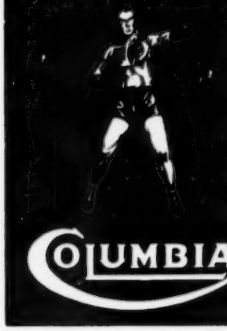


Originators of the . . .
"Insulation Filled" Exhaust Manifold
Shown here

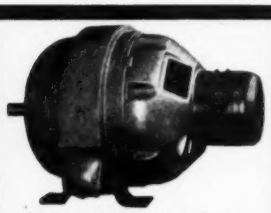
Lighter weight — Lower Cost

THE FLORI PIPE COMPANY
5700 BULWER AVE. • ST. LOUIS 15, MO.

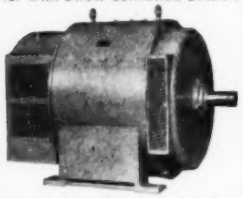
Champion Performers



COLUMBIA



93.8 KVA, 900 RPM, A. C. Generator with Direct Connected Exciter.



200 KW, 900 RPM, Protected, Two Bearing D.C. Generator.

A. C. AND D. C. GENERATORS. For the greatest exhibition of quality and service use performance proved Columbia A.C. and D.C. Generators. Available for coupled service, belt drive, single or two bearing.

A. C. Generators: 6¼ to 1000 KVA
D. C. Generators and Exciters: 2 to 300 KW

Write for descriptive literature. Our engineers will be glad to review your requirements.
Protected Territories Available to Qualified Sales Engineers.

COLUMBIA ELECTRIC MFG. CO.
4537 HAMILTON AVE • CLEVELAND 14, OHIO

What Do You Know!

(Answers to questions on Page 38)

1. Correct answer is "c". Unbalance-caused incomplete cleaning can have serious effects on various portions of the equipment. See the article on Page 44 for details.

2. "A" is correct. Many operators are finding that these liners speed cleaning operations and contribute to more effective cleaning. Again see article referred to above.

3. "A" and "d" are not recommended; in fact, some states have prohibited their distribution and sale. To find out why, read the article starting on Page 36.

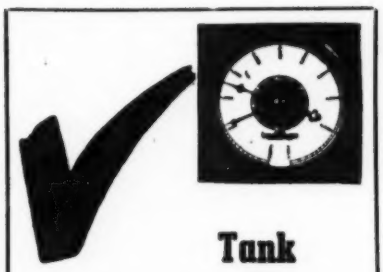
4. Correct answer is "c". Oxygen in the water will greatly accelerate the corrosion rate. It can enter through loose hose connections, leaky water pumps, etc., on the suction side of the circulating pump. Faulty gaskets can also permit combustion gases to enter. For more details see the article mentioned above.

5. "B" is correct. Depletion of inhibitors will vary with service factors and cannot be predicted with any accuracy. Manufacturers do not recommend re-use. Again, see article referred to in the above items.

6. Correct answer is "c". A forecast for 1953 and some of the reasoning behind it is given in the article starting on Page 32. In addition to estimated totals, breakdowns by end-use categories are given.

7. All four are correct. These are common causes of failure in traction motor roller bearings to which some others could be added. Some background concerning design and development and detailed discussion of proper application and maintenance practices are given starting on Page 74.

8. Correct answer is "a". This load is normally distributed over approximately 150 deg of the bearing circumference. See article above.



Tank Contents At A Glance

With Liquidometer remote reading fuel storage tank gauges you can check quickly and accurately oil deliveries, consumption and amount on hand. No Diesel plant is complete without one. Liquidometer or Levelometer models are available for tanks of any capacity.

Write for complete information

THE LIQUIDOMETER CORP.

36-24 Skillman Ave., Long Island City, N. Y.

BONUS

Send to DIESEL POWER the name of a friend who wishes to subscribe, and you'll receive—*free*—a copy of our famous 132 page Vest Pocket Diesel Manual—yours just as soon as his subscription fee is received.

MARCH OF DIMES

FIGHT INFANTILE PARALYSIS

JANUARY 2-31

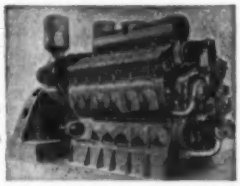
WANTED G. M. "71"

Discarded injector parts & assemblies. 10 to 1000

Interstate diesel service, incorporated
7120 CARNIGIE AVE. • CLEVELAND 3, OHIO

DIESEL ELECTRIC POWER

for IMMEDIATE SHIPMENT
Unit Capacities 100 to 1875 Kva A.C. 50-60 Cycles Various Voltages

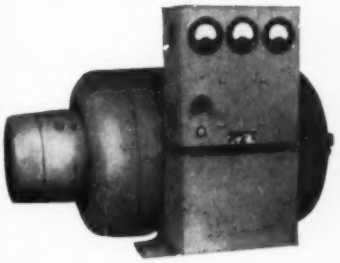


Write or wire today for bulletins and complete information regarding these fine fully guaranteed, low cost DIESEL ENGINE GENERATING UNITS. Visit our plants at Sausalito (S. F.), California, and Jersey City, N. J., and see units in operation on our test stand.

"SPECIALISTS IN DIESEL POWER"

A. G. Schoonmaker Co., Inc.
56 Church St., New York 7, N. Y.

A.C. anywhere
with **KATO** Generators
350 WATTS TO 300 K. W.



Larger sizes available in speeds of 720, 900, 1200, 1800 RPM at 60 cycles. Can be furnished as illustrated, complete in every way. Many sizes available with direct connected exciter. Odd frequencies from 25 to 400 cycles are our specialty, available in many sizes.

WRITE FOR FULL DETAILS

Manufacturers of Electrical Machinery Since 1928

KATO Engineering Company
1408 First Avenue • Mankato, Minn.

(*Continued from page* 101)

turns in two well-lubricated bearings as widely spaced as possible to provide good stabilization, and support close to the impeller and turbine wheel. Water-cooling is confined to the area surrounding the bearing at the turbine end. Piping is such as to provide some thermal circulation of the cooling water when the engine is shut down. Filtered oil from the engine system lubricates the bearings.

Air flow through the compressor is conventional with axial entry and radial discharge through the scroll case. In contrast with the larger units, exhaust gases enter the turbine radially to the nozzle ring and discharge axially. The turbine and compressor are close together and heat radiation from the hot turbine scroll case to the compressor is reduced considerably by shielding.

Why Turbocharge?

The primary reason for turbocharging is to obt higher specific output from an engine. This means a bet horsepower/weight ratio, improved mechanical efficier and, as a result of the latter, better fuel efficiency.

Waukesha has achieved all of these advantages. T specific gains in horsepower with no sacrifice in depe ability have been listed earlier. These were achieved wi out aftercooling. All of the units have shown lively acc eration, clean burning with all standard diesel fuels havi cetane values of 45 or above, an excellent reserve power and improved overall economy.

A FREE Sample for a Friend

If you have a friend or associate who you think might be interested in reading DIESEL POWER & DIESEL TRANSPORTATION, and would like to send him a free sample copy, we should be glad to cooperate with you. All you need to do is to fill in the convenient coupon while you have it in hand and drop it in the mail today. There is absolutely no cost or obligation to you. PLEASE PRINT PLAINLY.

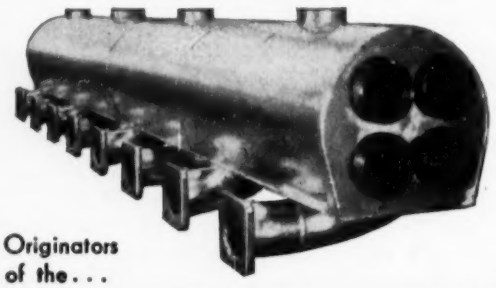
PAG

MISS

Save...

with Precision Manifolds built by FLORI

fabricated from "pre-machined" parts ... ready for attachment to the engine



Originators of the...

"Insulation Filled" Exhaust Manifold Shown here

Lighter weight — Lower Cost

THE FLORI PIPE COMPANY
5700 BULWER AVE. · ST. LOUIS 15, MO.

COLUMBIA

200 KW, 900 RPM, Protected, Two Bearing D.C. Generator.

A. C. AND D. C. GENERATORS. For the greatest exhibition of quality and service use performance proved Columbia A.C. and D.C. Generators. Available for coupled service, belt drive, single or two bearing.

A. C. Generators: 6¼ to 1000 KVA
D. C. Generators and Exciters: 2 to 300 KW

Write for descriptive literature. Our engineers will be glad to review your requirements.

Protected Territories Available to Qualified Sales Engineers.

COLUMBIA ELECTRIC MFG. CO.
4537 HAMILTON AVE · CLEVELAND 14, OHIO

What Do You Know!

(*Answers to questions on Page* 38)

1. Correct answer is "c". Unbalance-caused incomplete cleaning can have serious effects on various portions of the equipment. See the article on Page 44 for details.

2. "A" is correct. Many operators are finding that these liners speed cleaning operations and contribute to more effective cleaning. Again see article referred to above.

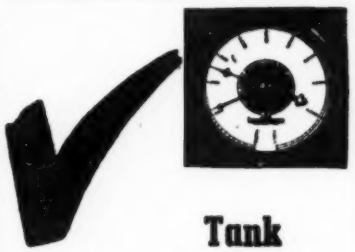
GES

SING

ng on Page 52. In addition to estimated totals, breakdowns by end-use categories are given.

7. All four are correct. These are common causes of failure in traction motor roller bearings to which some others could be added. Some background concerning design and development and detailed discussion of proper application and maintenance practices are given starting on Page 74.

8. Correct answer is "a". This load is normally distributed over approximately 150 deg of the bearing circumference. See article above.



Tank Contents At A Glance

With Liquidometer remote reading fuel storage tank gauges you can check quickly and accurately oil deliveries, consumption and amount on hand. No
omplete without
er or Levelom-
available for
acity.

te information

METER CORP.

ng Island City, N. Y.

IUS

OWER the name
wishes to sub-
receive—*free*—
mous 132 page
Manual—yours
his subscription

F DIMES

FIGHT INFANTILE PARALYSIS

JANUARY 2-31

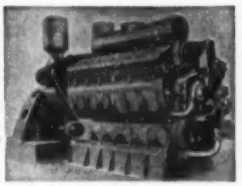
WANTED G. M. "71"

Discarded injector parts & assemblies. 10 to 1000

Interstate diesel service, incorporated
7120 CARNIGIE AVE. • CLEVELAND 3, OHIO

DIESEL ELECTRIC POWER

for IMMEDIATE SHIPMENT
Unit Capacities 100 to 1875 Kva A.C. 50-60 Cycles Various Voltages

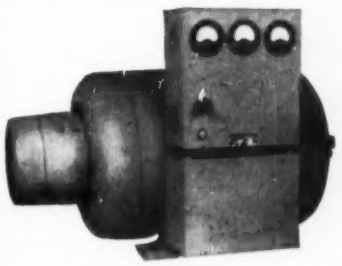


Write or wire today for bulletins and complete information regarding these fine fully guaranteed, low cost DIESEL ENGINE GENERATING UNITS. Visit our plants at Sausalito (S. F.), California, and Jersey City, N. J., and see units in operation on our test stand.

"SPECIALISTS IN DIESEL POWER"

A. G. Schoonmaker Co., Inc.
56 Church St., New York 7, N. Y.

A.C. anywhere
with KATO Generators
350 WATTS TO 300 K. W.



Larger sizes available in speeds of 720, 900, 1200, 1800 RPM at 60 cycles. Can be furnished as illustrated, complete in every way. Many sizes available with direct connected exciter. Odd frequencies from 25 to 400 cycles are our specialty, available in many sizes.

WRITE FOR FULL DETAILS

Manufacturers of Electrical Machinery Since 1928

KATO Engineering Company
1408 First Avenue • Mankato, Minn.

ADVERTISERS' INDEX

Aerofin Corp. 88
Aeroquip Corp. ***
Air Maze Corp. ***
Allison Engine Div., General Motors Corp. 24
American Air Filter Co., Inc. ***
American Bosch Corp. ***
American Brass Co. ***
American Diesel Service ***
American Locomotive Co. ***
American Motors Co. 89
Ashland Oil & Refining Co. 25
Atlantic Metal Hose Co. ***
Automotive Products Inc. ***

Bacharach Industrial Instrument Co., Inc. 98
Baldwin-Lima-Hamilton Corp. ***
Bendix Aviation Corp. Scintilla Magneto Div. ***
Binks Mfg. Co. ***
Borg-Warner Corp., Rockford Clutch Div. 93
Bowser, Inc. (Petroleum Marketing Div.) ***
Briggs Filtration Co., The 96
Brodie System ***
Brown & Sharpe Mfg. Co. 99
Brush ABOE, Inc., Petter Engine Div. ***
Burgess-Manning Co. ***
Burlington Instrument Co. 98

C. A. V., Ltd. 86
Chicago Pneumatic Tool Co. ***
Cities Service Oil Co. 30
Cleveland Graphite Bronze Co. ***
Columbia Electric Mfg. Co. 102
Cook Mfg. Co., C. Lee 26
Cooper-Bessemer Corp., The 13
Cummins Engine Co. ***
Cuno Engineering Corp. 11

De Laval Separator Co. ***
Delco Products Div., General Motors Corp. ***
Delco-Remy Div., Gen. Motors Corp. ***
Detroit Diesel Engine Division, Gen. Motors ***
Diesel Plant Specialties Co. ***
Donaldson Co., Inc. ***
Duluth Filter Co. 16

Eaton Manufacturing Co. ***
Electric Auto-Lite Co., The 4
Electric Storage Battery Co., The 12
Electro-Motive Div., Gen. Motors Corp. ***
Electro Products Laboratories ***
Elliott Co. ***
Ellwood City Forge Co. 10
Enterprise Engine & Machinery Co. ***

Fairbanks-Morse & Co. ***
Federal-Mogul Corp. 5
Fitzgerald Mfg. Co. 100
Flori Pipe Co., The 102
Fram Corp. ***
Fulton Sylphon Div., Robertshaw-Fulton Controls Co. Third Cover

General Motors Corp., Allison Engine Div. 24
General Motors Corp., Delco Products Div. ***
General Motors Corp., Delco-Remy Div. ***
General Motors Corp., Detroit Diesel Engine Div. ***
General Motors Corp., Electro-Motive Div. ***
General Motors, Harrison Radiator Div. ***
Golten Machine Corp., Sigurd ***
Gulf Refining Co. ***

Harnischfeger Corp., P & H Diesel Div. ***
Harrison Radiator Div., Gen. Motors Corp. ***
Hercules Motors Corp. 28
Hilliard Corporation, The 89
Hunt-Spiller Corp. 20

Ideal Electric & Manufacturing Co., Inc. ***
Illinois Testing Laboratories, Inc. ***
Indianapolis Drop Forging Co. ***
Ingersoll-Rand Co. ***
Interstate Diesel Service, Inc. 100, 105

Johnson Bronze Co. ***

Kato Engineering Co. 105
Kelite Products, Inc. ***
Kent-Moore Organization, Inc. 97
Kiene Diesel Accessories, Inc. 101
Kittell Muffler & Engineering, Inc. 97
Koppers Co., Inc., American Hammered Piston Rings Dept. 6

Lanova Corporation ***
Leece-Neville ***
Lempco Products, Inc. 91
Lewis Co., Warner 94
Link-Belt Co. ***
Liquidometer Corp., The 105

Madison-Kipp Corporation ***
Manzel 87
Maxim Silencer Co., The 21
Merlin Engineering Co., Ltd. ***
Mid-Continent Petroleum Corp. ***
Mutual Chemical Co. of America ***

National Welding & Grinding Co. ***
Nife, Inc. ***
Nordberg Mfg. Co. 9
Nugent & Co., Wm. W. 84

Oakite Products, Inc. 86
Ohio Crankshaft Co., The ***

Penn Controls, Inc. 83
Peterson Welding Labs., Inc. 85
Petter Engine Div., Brush ABOE, INC. ***
Phillips Petroleum Co. ***
Pickering Governor Co., The 99
Powers Regulator Co. ***
Pritchard & Co., J. F. ***
Pure Oil Co., The 14
Purolator Products, Inc. ***

Quincy Compressor Co. ***

Read Standard Corp. ***
Reiner & Co., John ***
Rochester Mfg. Co. ***
Rockford Clutch Div., Borg-Warner Corp. 93
Roper Corp., George D. ***

Schoonmaker, A. G., Inc. 105
Scintilla Magneto Div., Bendix Aviation Corp. ***
Sealed Power Corp. 15
Sharples Corp., The 23
Sims Co., Inc. ***
Sinclair Refining Co. 8
Snap-On Tools Corp. 90
Snow-Nabstedt Gear Corp. 95
Standard Oil Co., Inc. (California) 22
Standard Oil Co., Inc. (Indiana) Fourth Cover
Sterling Engine Co. ***
Struthers Wells Corp. ***
Surrette Storage Battery Co., Inc. ***
Synchro-Start Products 17

Texas Company, The 2nd Cover & 3
Thomas Flexible Coupling Co. ***
Tickle Engineering Works, Arthur ***
Tide Water Associated Oil Co. 18
Trane Co., The ***
Tuthill Pump Co. 89

U. S. Hoffman Machinery Corp. ***
Utilities Engineering Institute ***

Van Der Horst Corp. ***
Van Norman Co. ***
Viking Pump Co. 101
Vogt Machine Co., Henry ***

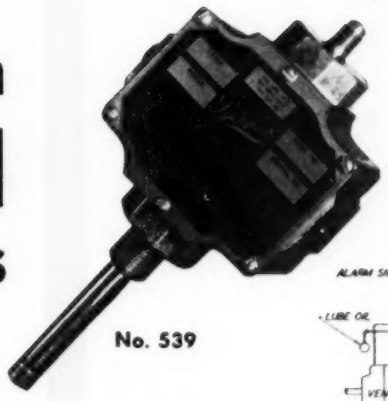
Washington Iron Works, Inc. 94
Waukesha Motor Co. 81
Weston Electrical Instrument Corp. ***
White-Roth Machine Corp. ***
Wildermuth, Inc., E. A. ***
Winslow Engineering Co. 7
Woodward Governor Co. ***
Worthington Corporation 19

Young Radiator Co. ***

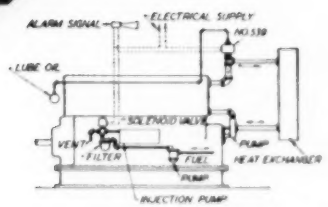
Why take chances on engine trouble?

No. 923-3

Depend on SYLPHON controls



No. 539



Typical installation of No. 539.

YOU NEVER NEED to cross your fingers —or trust to luck—with these Sylphon controls. When they're on the job, they safeguard you against engine trouble—day and night. They help ward off costly shut-downs, damage or repairs.

No. 539 control gives positive protection against high jacket water temperature or low lube oil pressure. If water jacket temperature goes above, or lube oil pressure goes below safe limits, it sounds an alarm—or shuts off the engine. Also available for temperature or pressure only.

No. 923-3 Regulator is equally dependable. It thermostatically controls cooling water circulation—keeps engine jacket temperature right. Can be manually operated —if and when desired!

Both controls are ideally suited to diesel, gas or other internal combustion engines. Self-contained and self-powered, they're built to give you long, trouble-free service. Easily installed. For complete information, send for Bulletin AD-817.

FS

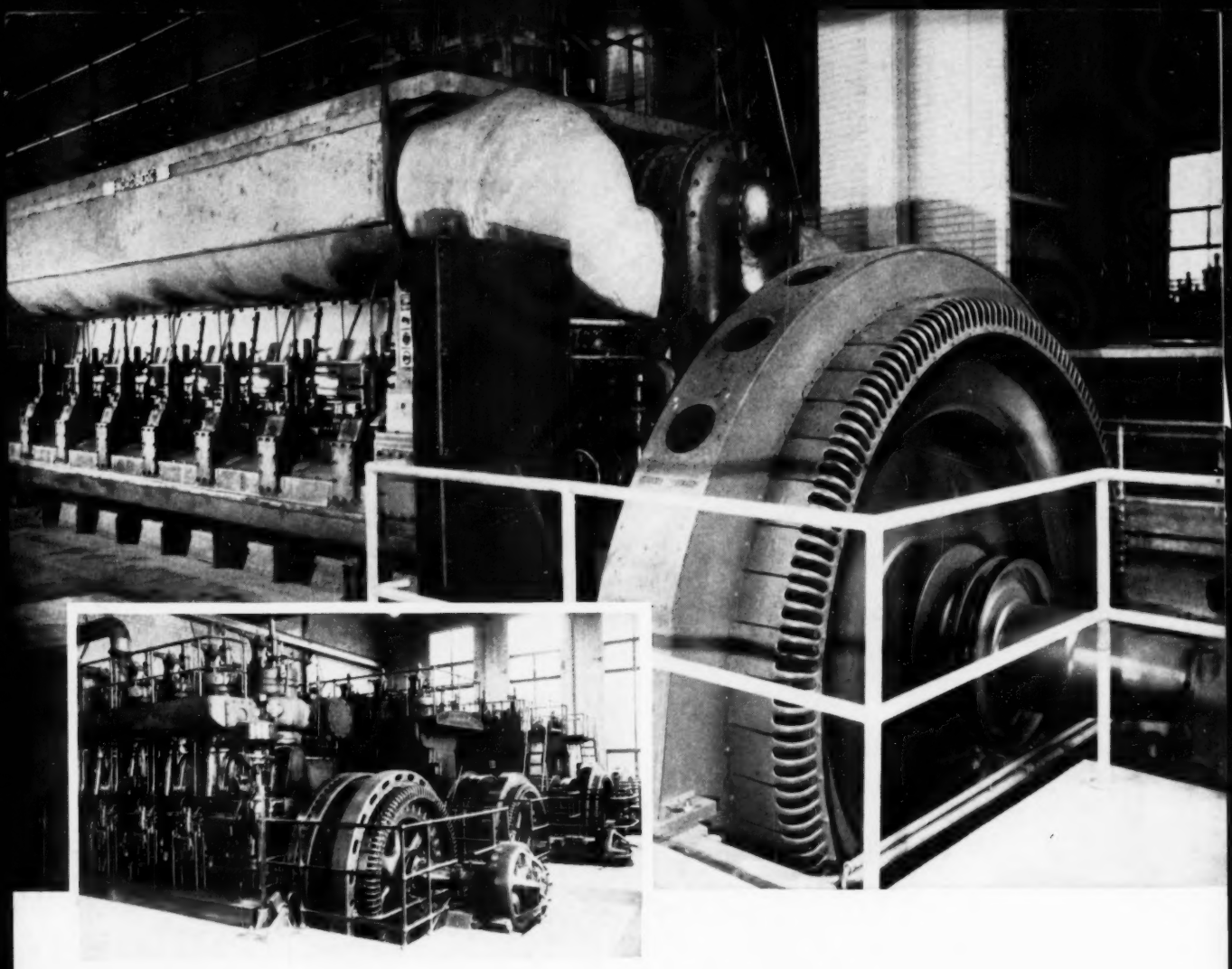
FIRST WITH BELLOWS

Temperature Controls • Bellows Devices • Bellows Assemblies

FULTON SYLPHON
DIVISION

ROBERTSHAW-FULTON CONTROLS CO., KNOXVILLE 4, TENN.

Canadian Representatives, Darling Brothers, Montreal



Rensselaer, Indiana, plant gets record economy with...

● Shown above are the five diesel engines, totaling 7 150 hp., which make the Rensselaer municipal plant one of the largest of its kind in Indiana. The efficient operation of these diesels has helped keep Rensselaer's lighting rates among the lowest in the state for cities in the 2,500 to 10,000 population group.

Contributing to this successful record, Standard Oil's diesel fuel and lubricants have helped keep operating and maintenance costs low. STANDARD HD Oil has played a particularly important role. This outstanding heavy-duty lubricant has provided effective lubrication of vital cylinder areas. It has kept cylinders and rings protected against excessive wear and free from deposits. How these benefits contribute to high operating efficiency is shown by the performance of the plant's newest and largest diesel, a 2,800-hp unit. In a typical month, this unit has operated for 444 hours, carried an average load of 54%, and generated 13 kw-hr per gallon of fuel with a lubricant consumption rate of 9,414 hp-hr per gallon.

Throughout the Midwest, diesel operators are getting record efficiency and economy with the help of STANDARD HD Oil. The Standard Oil lubrication specialist in your area will be glad to give you information concerning the use of this superior heavy-duty lubricant in plants with which you may be familiar. Just phone your local Standard Oil Company office for his services. Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Illinois.

STANDARD HD
TRADE MARK
OIL

STANDARD OIL COMPANY

STANDARD *(Indiana)*